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Job satisfaction of managers and individual contributors within local and virtual software teams

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JOB SATISFACTION OF MANAGERS AND INDIVIDUAL CONTRIBUTORS WITHIN LOCAL AND VIRTUAL SOFTWARE TEAMS

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by

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ABSTRACT

This study compares the job satisfaction of individual contributors and managers on local (co-located) software teams versus those working on virtual teams. It also examines differences in job satisfaction among workers of differing experience levels. Participants were recruited from two software organizations; one from Company V and one from Company L, a spinoff company formed from Company V's former semiconductor division. The Company L team was a local (co-located) team housed in one building. The Company V team is a distributed virtual software development team and is spread across five cities in California, Oregon, Arizona and Texas. Some members of the Company V team work in Malaysia, but were not included in this study.

A total of 40 software engineers and their managers were surveyed using the Job Descriptive Index (JDI) for job satisfaction, a valid and reliable instrument with over 30 years of historical data to support it. Comparative statistics were used to determine if there were differences in job satisfaction between the two teams. In addition, the results were sorted by experience and job satisfaction, after which, comparisons between the four different experience levels were made. The four experience groups were: 0 to 5, 5-10, 10 to 20 and 20 or more years of experience.

The study showed strong similarities in job satisfaction between these two organizations. There was little notable difference in job satisfaction between the two groups (Company L and Company V) and among the four experience levels. The results of this study are important because they support claims that the experience of workers on a virtual team is similar to that of those on traditional co-located local

team. This study also suggests that there is little difference in job satisfaction among workers of differing experience levels for these two groups of software engineers and their managers.

Chapter 1: Introduction

Overview

Background. Increasingly, workers and managers are finding the traditional brick-and-mortar office is being augmented and/or replaced by the virtual workplace. As the virtual office becomes commonplace both workers and managers are learning to adapt. Since this is a relatively new phenomenon, the pool of research related to job satisfaction for workers and managers of virtual teams is relatively small. This study will build on existing research related to job satisfaction of virtual teams, comparing job satisfaction of managers to individual contributors working in virtual teams.

Early research. Virtual teams began unceremoniously in the 1960s and 1970s using telephone lines to connect to mainframe computers. The growth of virtual teams blossomed with the advent of the Internet. Researchers began to recognize and study the telecommuting phenomenon in the 1970s.

Organizational design expert Fritz Steele (1975) wrote one of the first books on virtual organizations. He was one of the first to look at open (or virtual) organizations from the perspective of job satisfaction. Steele was concerned with open communications in organizations and studied the effects of openness on groups separated by distance. Steele created a variable that he called “disclosure” to measure open communication in organizations. He classified organizations with closed cultures as Lo-D (D for disclosure) and those with a high degree of disclosure as Hi-D. Steele (1975) uses the following definition for disclosure: “Disclosure means

sharing with another person, or persons, information which we have at present hidden from others" (p.7).

Steele (1975) is an advocate of open organizations and believes they are more effective and efficient. Extremes in either direction can damage organizational effectiveness. Steele identifies three threats to workers who hide information. They are (a) evaluation, (b) investment in maintaining the relationship, and (c) loss of control. Workers may be afraid that further evaluation will uncover incompetence or wrong doing on their part. They may also be concerned that the release of sensitive information will hurt their relationship with their boss or coworkers. By hiding information, workers retain control of the situation. Once the information is released, the individual loses control. Workers may decide not to take the risk of exposing themselves and may isolate themselves rather than risk hurting themselves by being open: "Disclosure can have a powerful impact, if it rallies others to move toward less secrecy, but there is a time lag, which may make one too vulnerable to counter-forces. One can be arrested or fired before others are even aware of the issues" (Steele, 1975, p.127).

Members of virtual teams may be less concerned about passing along data due to the perceived anonymous nature of computer-based communication (email, electronic forums, chat, etc.). There is less risk of public intimidation or embarrassment. Steele is an advocate of an office environment where workers are located in close proximity. He believes they naturally breed disclosure and are more likely to result in Hi-D environments (Steele, 1975). Hi-D environments create an environment where the status quo is challenged and problem solving is commonplace with less fear of

consequences. The Lo-D organization is content with the status quo and works to maintain an even keel. Hi-D organizations place more value on learning and growth (Steele, 1975).

The following quote by Dr. Steele (1975) summarizes the resulting environment well:

> By contrast, the system that avoids these demands, that tries to hide its basic workings in order to avoid being confronted about them, is the system that will not grow and change with the times. With no challenge there is no incentive to change, to improve problem solving, or to adapt to changing external conditions. The motto is "We'll get by as we are." The essential difference is that a Low D system has opted for the static state, for maintaining things on an even keel, for avoiding upset of internal difficulties; by contrast, the system that exposes its own processes to internal and external view is one that places a higher value on learning and growth than on homeostasis and smooth operations. The latter system has an inherent advantage over the former; it is more resilient in the face of stress and more adaptable in the face of change. (p. 134)

Implications. As early as the 1970s, visionaries like Geoff Mulgan (1997) came to understand the implications of an increasingly interconnected world. He noted that the limits and traditional boundaries of countries and their empires were beginning to fall. Forty years later it appears he was right. Countries like China are working to combat the flow of information in an effort to curb the outside influence enabled by the Internet. He foresaw the influence open communication would have on international politics and governments and even made the claim that some

governments would fail as a result (Mulgan, 1997). As workers find themselves more interconnected they are motivated to learn new skills so they can participate in the global economy. The goal of education in many countries has shifted from the old idea of enriching one's life by gaining wisdom or improving one's character to improving one's monetary position. Globalization is driving the creation of more global virtual teams (Mulgan, 1997).

Contemporary books like *The World is Flat (2006)* support Mulgan's ideas. Mulgan had recognized the early signs of globalization. Friedman (2006) calls the leveling of the global business environment "flattening". He identifies the world-wide-web, workflow software, uploading, and off shoring as some of the key "flatteners" creating a global workforce (Friedman, 2006). As new models for doing business emerge, new organizational models are being created to support them. Hierarchical organizations are evolving into what Malone (2004) calls decentralized organizations. Loose hierarchies characterize these new organizations where decisions are moved to the lower levels of the organization. He uses the example of consulting firms that have moved all operational decisions to partners and consultants (Malone, 2004). Many companies are moving to an outsourcing model that creates flexible webs of small companies rather than one large corporation (Malone, 2004). Some companies are moving to a model where they create markets inside companies and trade internally as if they were working with outside organizations. An example of this is Hewlett-Packard's internal labor market, where workers are assigned to projects from a pool of experts (Malone, 2004). Internal talent pools resemble the outside world. If an individual requires the service of a plumber, they hire one. At

Hewlett-Packard if they need an engineer they hire one from the internal engineering pool. The engineer may live in India and may find they are working remotely with a project team in Chicago. This is a good example of the new "Flat" world described by Friedman.

Malone saw this shift for organizations where a diverse group of workers, working from locations all over the world, were empowered to make their own decisions and manage their own mini-organizations. Malone's vision of the future appears to be correct and the role of the manager and the line worker has shifted dramatically. It has shifted to a point that would have been unimaginable to a worker from the 1950s, where hierarchical organizations were typical. In Malone's new world the question of whether workers will be more satisfied remains to be answered. Although there has been a great deal of research conducted on job satisfaction in traditional local teams, the body of research on virtual teams is relatively small.

2007 Engineering-Design-News study. In a 2007 *EDN (Engineering Design News)* conducted a worldwide survey of engineers. Given the trend toward outsourcing, the author expected North American engineers to score low in job satisfaction. The results of the survey showed North American engineers to be more satisfied than engineers from Asia and Europe (Wright, 2007). The survey results showed that North American workers were the most satisfied group; Indian engineers placed second, with 27% very satisfied. European engineers too were very satisfied with their work, but just 2.8% of Japanese engineers chose very satisfied (Wright, 2007). Outsourcing and job security were the top complaints for North American workers (Wright, 2007). Japanese workers have also been affected by outsourcing.

The survey showed that North American, European and Indian engineers draw satisfaction from their work, while Chinese engineers consider opportunities for advancement as their primary measure of satisfaction (Wright, 2007). Key factors in job dissatisfaction range from complaints about management to lack of recognition and decision-making power (Wright, 2007).

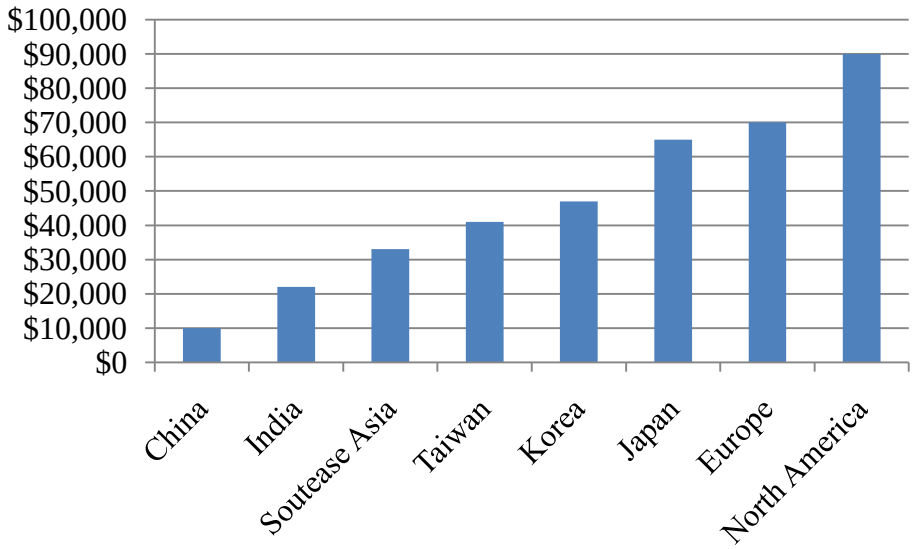

Figure 1. EDN salary 2007 salary survey results.

The results of the salary survey conducted by EDN are shown in Figure 1. The chart shows the relative salary for engineers in eight countries. It may be inferred from the chart that high salaries play an important role in a company's decision to move work offshore. Based on the EDN data, nine Chinese engineers can be hired for the cost of one North American engineer. Pay may be a factor in job satisfaction but when EDN polled its worldwide subscribers directly on the subject they discovered the following: "Surprisingly, most respondents in North America feel somewhat satisfied to very-satisfied. The 30% that chose very satisfied dwarfs the response in that category from all of the regions that EDN Asia covers"(Wright,

2007, p.61). These data suggest that American workers may be more satisfied than their Asian counterparts.

Managers and virtual teams. Office politics are a fact of life in most American companies. Managers, by their very nature, are political animals (Pfeffer, 1981). As decision-making moves to lower levels of the organization office politics can become more complicated. The trend of empowering workers may upset the political balance and reduce control previously enjoyed by some managers. Pfeffer (1981) notes that power and politics need-be understood as well as important organizational processes. The political nature of managers cannot be ignored, and should be embraced, as many managers are effective politicians. As organizations move into the virtual world, the political landscape may change and upset the delicate balance that allows many managers to thrive. Managers may not be satisfied in their new role in virtual organizations. Managers may also need to learn new skills to cope with an increasingly diverse workforce.

By their very nature, global teams are more diverse. A typical contemporary team may consist of North American, European, Indian, African, Russian and Chinese workers. Individuals who are open to working within a diverse team may find greater satisfaction and success; those who are prone to prejudice and bias may find the virtual world a more difficult place in which to succeed. Dimensions of diversity have a great impact on organizational effectiveness (Cox, 1993). Research suggests that black MBAs had significantly lower job involvement than whites and that women had significantly lower job involvement than men. Job involvement is closely related to job motivation and is a good predictor of job turnover. Congruence

between managers and production workers contributes strongly to job satisfaction. Cultural differences can create incongruence, which can lead to poor performance and differences in individual work outcomes (Cox, 1993). Cox (1993) suggests there are substantial data to support this claim. If one carries the argument into the virtual office, where diversity will likely be the norm, it can be expected that productivity on some teams will suffer.

Cox (1993) contends that diversity needs to be managed and that if it is managed it can lead to more productive teams. He uses the example of adding day care facilities to offices to help attract female workers, and points to data that shows having women in the workforce enhances productivity a great deal. This idea can be extended to the virtual workplace, where allowing women to have flexible work hours and work more from home can help bring talented women, who otherwise might put their careers on hold to raise a family, into an organization and make it more productive.

Trust in organizations. A recurring theme in related literature on organizational effectiveness is trust. The extraordinary performer will give full effort regardless of whether or not the boss is watching. They give special effort only when they feel trusted by their manager and peers. They observe that it is rare for an employee to excel under the punitive thumb of someone they don't trust and respect. When trust is low, workers spend time covering themselves and being compliant to dictates that they know are counterproductive. Recommendations for building trust on virtual teams include the use of weekly voice mail, monthly newsletters, and semiannual videotaped presentations. Key attributes of good managers are: communicate

openly, give trust, be honest, be ethical, do what you say you will do, be consistent, set the tone for future interactions early, and be accessible (Fisher & Fisher, 2001). These attributes are extendible to managers of virtual teams.

Building trust in any organization, virtual or local, is important in creating a healthy happy team. Kostner (1996) observes that one of the greatest challenges of a remote leader is to develop trust. She observes that remote teams have a uniquely hostile environment in which to develop trust. Problems associated with developing trust are compounded by the inability of virtual teams to interact frequently like local teams. If the manager ignores trust issues they can quickly destroy trust in the group and performance and synergy will suffer (Kostner, 1996). It is the role of the leader to create symbols and structures that solidify the unity of the dispersed work group (Kostner, 1996).

The link between trust and worker and manager satisfaction is significant. The isolation that workers feel when working remote can have a significant impact on the well being of satellite workers. Remote workers miss being in the middle of the action. They miss the informal contact and socializing that are a part of a local team's workday. Selecting people to work remotely requires some discipline. People who value social interaction at part of their workday may be unhappy working from home. Satellite workers may require stronger interpersonal skills that those working locally to be productive. They need to be results oriented individuals who are satisfied with being judged primarily by their work (Fisher & Fisher, 2001).

Summary. Thomas Malone, Fritz Steele and Thomas Friedman share common views on trends driving the creation of more virtual organizations. Steele and

Malone began to study the implications of globalization as early as 1970. Here, in the beginning of the 21st century, executives and managers are grappling with the challenges posed by these changes in the work environment. This study examined job satisfaction among virtual workers and compared it to workers on local teams.

Problem

Pioneers like Fritz Steele and Thomas Malone recognized the trend toward globalization. Their research coupled with the work of Thomas Friedman implies that workers in the 21st century will increasingly find themselves working on virtual teams. It is useful in identifying internal and external factors that may influence future strategic decisions. Using data extracted from a work-study conducted by Itzhak Harpaz in 2002, a Strength, Weakness, Opportunity, and Threat (SWOT) analysis was constructed (see Table 1).

Table 1

Virtual vs. Local Team SWOT

	Individual Contributor	Manager
Strength	Autonomy/ Independence Flexible working hours Improved time management Professional flexibility Savings in time travel and expenses Flexibility in arranging supervision of family members/ dependents	Increased productivity Increased provision of human resources Significant decrease in absence and tardiness levels Savings in direct expenses Increased motivation and satisfaction
Weakness	Lack of professional support Impeded career advancement Possible damage to commitment to and identification with the organization	Application difficulties for centralized organizations
Opportunity	Increased productivity Decrease in absence and tardiness levels Decrease in traffic/congestion	Savings in infrastructure and energy Solution to special needs populations
Threat	Impaired feeling of belonging Feeling of isolation	Cost involved in the transition to telecommuting Legal issues Changes in work methods

The SWOT derived from Harpaz study helps develop an understanding of the pros and cons of virtual teams (Harpaz, 2002). Autonomy is categorized as a strength because it empowers individuals and "control over work occurs more freely and naturally" (Harpaz, 2002, p.75). Other strengths are flexible work hours, improved time management, professional flexibility, savings in time travel and expenses, and flexibility in arranging supervision of members/dependents, according to Harpaz (2002).

Strengths identified from the organizational perspective or management perspective: the Harpaz study points to increase productivity, increased provision of human resources, significant decrease in absence and tardiness levels, savings in direct expenses and increased motivation and satisfaction. It can be inferred from the study that workers on virtual teams will be more productive and save the organization money. Some of the weaknesses for individual contributors on virtual team uncovered by the Harpaz study include lack of professional support, impeded career advancement, possible damage to commitment to and identification with the organization (Harpaz, 2002).

Weaknesses from an organizational or management perspective highlighted in the Harpaz study point to difficulties confronting centralized organizations (Harpaz, 2002). It is implied that empowered workers residing in low levels of the organization make for stronger virtual teams. Organizations with tight central controls may struggle when employing virtual work teams.

The Harpaz study points to opportunities for virtual teams to increase productivity, decrease absenteeism, and reduce traffic and congestion in urban areas. From the managers' perspective, they may save money on energy and be able to tap into the population of special needs workers who cannot leave their homes (Harpaz, 2002).

Some of the threats identified in the Harpaz study for virtual teams include impaired feeling of belonging and feelings of isolation by individual contributors, perhaps creating an environment that may prompt them to leave. Managers may find there is a cost associated with migrating to virtual teams. For example, they may

need to change work methods and are likely to see an increase in legal issues (Harpaz, 2002). The Harpaz study concludes that remote workers may benefit from a more balanced lifestyle and that advantages of working on virtual teams outweigh their disadvantages. More research needs to be done to support the conclusions of his study (Harpaz, 2002). Although there has been significant research on job satisfaction there has not been a great deal of good research on virtual work environments and their effect on job satisfaction.

The Harpaz (2002) study highlights the fact that challenges faced in implementing a virtual organization are substantial. The challenges faced by the worker are not as significant. Cost, legal concerns and new challenges to organizational dynamics create new challenges for a company. Managers may feel like they are taking an unnecessary risk in implementing a work at home policy. Organizational culture will be a primary factor in resistance to change (Schein, 1992). Managers need an incentive for moving from the time-tested model of local teams to the relatively unproven model of virtual teams. The primary motivator is likely monetary, as evidenced by the EDN survey. Managers are willing to take the risk if significant cost savings can be realized. The upsides for individual contributors are outlined in the SWOT analysis.

New technologies have created a fundamental shift or inflection point in the world not unlike the one created by the industrial revolution (Friedman, 2006). As the world continues to become flat, old models of doing business are mothballed; there are threats to old business norms and new opportunities for those that are willing to pursue them. As the business environment shifts, the worker is left to

absorb the new reality and must adapt to new ways of working. The question is, will this improve or degrade their present work experience? Will workers find themselves isolated and unhappy or liberated and energized by the new "flat" world? The problem is that remote workers may be worse off as compared to workers on local teams. They may find themselves isolated, underappreciated, and expendable. Measuring job satisfaction will help quantify differences between the two groups by providing a differential indicator of job satisfaction.

Definition of Terms

Job Satisfaction: "Job satisfaction is defined as the feelings a worker has about his or her job or job experience in relation to previous experiences" (Balzer et al., 1997, p. 10).

Individual Contributor: An individual contributor is defined as a first level worker with no direct reports and no management responsibility. Individual contributors for the purpose of this study are software engineers with no direct reports.

Manager: The manager is a person managing others. For the purposes of this study, the manager is a software manager. He or she can be managing other managers or individual contributors (direct reports).

Remote Worker/ Telecommuter/ Distance Worker: For the purpose of this study, workers working in remote offices or from their home are referred to as remote workers, telecommuters, or distance workers. The definition can be applied to individual contributors and managers. The manager may be managing the team from his/her home office or from a remote site.

Local Team: The term local team is used in this document to refer to a team that works in the same physical location. Local teams are all on the same physical campus, though the campus may vary in size.

Main Office: For the purposes of this study, the term "main office" will be used to describe the central hub of activity. The main office is the place where the core members of the team reside but may not be the where the manager of the team works. The manager could be working from home or from a remote office while receiving his or her direction from the main office. Virtual office structures and organizations vary widely from company to company. "The workforce is now spending less time in the office in favor of carrying out their functions virtually anywhere" (Stocks, 1998, p. 30).

Home Office: Home office refers to an office in a worker's home.

Satellite Office: An office building that is used by the work team but is physically remote from the main office. This office may be in the same city, another city, or another country.

Purpose

The purpose of this study is to determine the extent to which, if at all, there is a difference in job satisfaction between managers and individual contributors while working as part of local as compared to virtual teams.

Research Questions

The research questions that are addressed in this study are as follows: To what extent, if at all, is there a difference in job satisfaction between managers and individual contributors on local versus virtual teams? In addition, several

demographic groups based on age and years of experience were examined. The first demographic group was software engineers younger than 25 years old, the second group was software engineers and managers from 25 to 35 years old, the third group software engineers and managers from 35 to 50 years old and finally those over 50 were examined. Since software engineering is a relatively new field, a majority of practicing software engineers are under 35. The demographic analysis will help gain an understanding of the effects in job satisfaction within each age group. The demographic study is design to answer the question, to what extent, if at all, is there a difference in job satisfaction across the following four groups of workers: entry level, mid level, senior and pre-retirement software engineers?

Importance of Study

A study of just over 33,000 Canadian office workers showed 38% of the sample thought technology that enabled work from home made it easier for them to balance work and family life while another 38% found the opposite to be true. Over 70% of this same group said that work at home technology (cell phones, Blackberry, etc.) had increased their workloads and stress levels. The trend toward virtual organization represents a fundamental shift in the way business in being done around the world (Towers, Duxbury, Higgins, & Thomas, 2006).

In theory, the new world of telecommuters and remote workers will improve job satisfaction and work life balance (Harpaz, 2002). In practice, this may or may not be true, but there is not yet a large body of data to support or refute this claim. As the Canadian study showed, workers seem to be split on the benefits of working from

home while the majority agreed it was creating more stress in their lives (Towers et al., 2006).

The American workforce will find itself competing with workers from other countries. Workers will find themselves competing for jobs that were traditionally American jobs and will need to continue to educate themselves and acquire new skills to compete effectively on a global playing field (Friedman, 2006). This study is important because the body of research on this subject is relatively small. There is a need for more research. As global teams become commonplace, workers and managers will be required to adapt. Studying the effect of this new model on workers and managers will help companies better understand the implications of their actions. If there is a link between job satisfaction and productivity, then gaining a better understanding of job satisfaction on virtual teams is important.

Assumptions

Several assumptions have been made for this study. This study deals exclusively with software engineers working for Company V (Fortune 500 Company) and Company L (a Company V spinoff). The results of this study may not apply to other companies. The outsourcing of jobs to India and China has impacted the software engineering community significantly. Software engineers often work in virtual environments due to the nature of their work. One assumption is that all software engineers have similar roles and responsibilities. It would be difficult to compare software engineers to administrative assistants, for example. The roles and responsibilities of the two jobs are very different.

Since the study will focus on North American engineers, it assumes there are cultural similarities between workers, however, corporate cultures may influence worker satisfaction and that will not be factored into this study. It is assumed that the relationship and experience of managers in this study is similar across groups. The survey participants are to be drawn from a random sample, participants will be asked to self-categorize. This may have an effect on the accuracy of the demographic data.

Limitations

The study will be limited to Software engineering teams, comparing virtual to local teams. Groups will be selected based on their makeup, local versus virtual. This may limit the number of managers available for the survey. For example, five software teams would only have five managers, but may have 50 individual contributors. Statistical methods for small sample sizes will be employed to normalize the data.

The results will be subject to the limitations of the JDI instrument. The JDI instrument has 40 years of data to support the results, but is not a perfect instrument. "The JDI measures five principal facets of job satisfaction that have been identified as important across numerous organizations: work itself, pay, promotion, supervision and co-workers" (Balzer et al., 1997). In the next chapter a review of published literature will be performed to help understand where this study can add to existing research.

Chapter 2: Literature Review

Although virtual organizations are a relatively new phenomenon, there is a substantial body of literature on the subject. Telecommuting began with the invention of the telephone and has been fueled by the exponential growth in the communications industry. The personal computer has become the platform for many new telecommuting tools. Some common telecommuting tools include email, instant messaging, blogs, podcasts, RSS feeds, VoIP and video conferencing facilities (Das, Yaylacicegi, & Canel, 2008). Using these technologies, virtual worlds can be created to simulate traditional office environments. The following literature review concentrates on articles related to working on virtual teams in relation to both work group effectiveness and job satisfaction.

Virtual Teams

A growing trend in today's global economy is the increased use of virtual teams. One investigation conducted by Frank Horowitz, Desmond Bravington, and Ulrik Silvis (2006) that cross-cultural communication improvement, managerial and leadership communication, goal and role clarification, and relationship building are most important to virtual team performance. Their study included a total of 115 employees in virtual teams. They were surveyed using a quantitative Likert instrument and qualitative explanatory questionnaire. Their survey measured leadership communication, social cohesion, relationships, and trust.

Trust is a common thread in most literature on virtual teams, although that could also be said about local teams. Casalo, Flavian, and Guinalu (2008) conducted a study to evaluate relational capital to determine the factors that determine

commitment to a virtual community. Their data showed that trust placed in a virtual community has a positive and significant effect on commitment to the virtual community. They also found that a greater familiarity with the community and a stronger norm of reciprocity in communication in the community might increase the level of trust placed in the virtual community.

Hobbs and Armstrong (1998) in their psychological study of remote workers found through their experiments with NASA that tasks completed by remote workers were of comparable quality to tasks completed while working in the office. Their research into the psychological aspects of working remotely found that to some degree the workers feelings of isolation were related to the task. They make a distinction between loneliness and aloneness. Many tasks require isolation, like scientist recording seismic activity in remote locations. They point to new technologies as helpful in reducing loneliness. Cell phones, teleconferencing, email and online tools can make a person feel connected to others. Some workers felt that they had lost status in the organization once they began working remote. They found some correlation between status and performance.

Working from Home

Itzhak Harpaz (2002) observes that the phenomenon of working from home is not a new one. Before the industrial revolution, most work was carried out at home. The real change therefore is not the advent of telecommuting, but its impact on the organizational framework. In this new virtual world, worker-organization interaction takes place primarily through the use of the modern communication infrastructure.

Harpaz (2002) goes on to list the advantages of telecommuting. He identifies the following advantages: autonomy/independence, flexible working hours, improved time management, saving time and money traveling, and flexibility in arranging supervision of family members and/or dependents. Some of the disadvantages are feelings of belonging, feelings of isolation, no separation between spheres of work and home, need for self discipline, lack of professional support, impeded career advancement, over-availability syndrome, personality unsuitability, legal issues, and the creation of a detached society. Harpaz's study concludes that telecommuting can offer the worker and efficient solution for a more balanced lifestyle. He also found that it can contribute to an improvement in the quality of work and family life as well.

A management study conducted in 2002 found that 93% of American telecommuters said they would like to continue telecommuting until they retire (Ilozor & Ilozor, 2002). Respondents cited saving time, reducing job related expenses, and reducing stress as reasons for their preference for telecommuting. Fifty-five point eight percent of respondents disagreed or strongly disagreed that their job related stress had reduced. Dubrin and Barnard's (as cited in Ilozor & Ilozor, 2002) research showed that 72.1% believed their output increased progressively as a result of telecommuting, studies by Bers and Wood (as cited in Ilozor & Ilozor, 2002) show that there can be a danger of work-time creep. Workers may end up working around the clock (Ilozor & Ilozor, 2002).

Characteristics of Telecommuters

Diane-Gabrielle Tremblay conducted a study to determine the personal characteristics of telecommuters. She looked at personal characteristics, types of tasks

performed, and working conditions. Her study showed that 58.8% of telecommuters in her random survey were self-employed, 35% non-unionized employees and 6.6% unionized employees. Fifty-eight percent of the workers were men, 70% between the age of 26 and 45 years old, 47% were married with children, and 60% had university degrees – which is higher than the general population (Tremblay, 2002). Ninety-four percent of the workers surveyed volunteer to work remotely and their general level of satisfaction was high. The vast majority said they would refuse to return to a traditional workplace. Some even contemplated quitting if faced with returning to the office (Tremblay, 2002). The majority of respondents cited flexibility as the primary benefit to working remotely. Although they appreciated more time with family, that was not the primary benefit in their mind.

The Internet has become the primary tool of telecommuters, or distance workers. The Internet has lowered the cost of transactions, improved efficiencies in the supply chain and enhanced competition resulting in broadened markets for both buyers and sellers (Strader, 2002). In a short time the Internet has gone from being the communication tool of scientists to a primary method of communication for the masses. Attaran and Attaran (2002a) call this the coming age of collaborative computing. There are wide ranges of tasks that can be performed using computer collaboration. Some of the tools enabling computer collaboration are email, group conferencing, task delegation, project management, data sharing, data storage and retrieval and time billing applications (Attaran & Attaran, 2002a). These new tools are facilitating the creation of virtual workplaces. As Internet speed continues to

improve and software collaboration capabilities continue to evolve companies will be compelled to move work out of the office to home or satellite offices.

Types of Remote Workers

As the number of tools for collaboration increase, they can be categorized. Attaran and Attaran (2002a) define these classes in the following way: information retrieval and utilization, communication and data transmission, distribution of products and services, organizational transactions. They further categorize these technologies as they relate to business productivity. They define seven categories: virtual meeting, teamwork, project management, supply chain collaboration, Internet broadcast, information sharing and virtual jam (allows musicians to collaborate). They cite that none of these technologies can completely replace human interaction, and in the case of the digital jam, most musicians are resistant to this technology (Attaran & Attaran, 2002b). They observe that this new technology is allowing smaller companies to adopt many of the cost saving tools that larger companies with large I.T. departments have enjoyed, giving them a competitive advantage. These new tools are leveling the playing field.

As more people begin to migrate to work-at-home or remote work locations, the existing office environment will change. New concepts in office design take into account remote workers and new ideas have been spawned like “hot desking”, “touchdown” and “hotelling”. “Hot desking” involves the shared use of one desk by more than one employee. A “touchdown” space can be a rented workspace within a working office, or a cubicle that is located in a business center. “Hotelling” is reservation-based unassigned seating, whereas, hot desking is reservation-less

unassigned seating (Dent & White, 1998). Fifty-five percent of large firms responding to Dent and White's survey indicated that "teleworking" is having an impact on how they choose office space. These new office environments are putting an increased burden on I.T. departments as they attempt to accommodate distributed virtual offices (Dent & White, 1998).

Organizational Challenges of Virtual Teams

The increased move toward virtual offices is putting pressure on both organizations and individuals to become more flexible. Long held archetypes for office behavior and structure are being challenged at an increasing rate. From a strategic perspective downsizing, de-layering and outsourcing non-core functions are becoming commonplace (Gibson, 2003). This has led to a division between the core and periphery workforce. Core teams find themselves interacting with contractors and part time workers performing tasks that were formerly accomplished using internal corporate resources (Gibson, 2003). Workers are no longer tied to a desk in an office, but can now seek to find the most appropriate place and/or environment for the task.

Many workers have now been introduced to flexible work arrangements. Contemporary workers no longer question flexible work arrangements; they expect it (O'Brien & Hayden, 2008). Flexible work arrangements are seen in many cases as a right or an automatic privilege. People are attracted to companies that provide a flexible environment because workers now have the perception that it enables a "balanced life" (O'Brien & Hayden, 2008).

Janice Black and Sandra Edwards (2000) examined the emergence of virtual organizations as a fad. They question whether the trend of telecommuting and virtual

offices is here to stay, or just something companies are experimenting with. They contend that virtual or networked organizations represent new organizational forms. They question their viability by comparing the phenomenon to chaos theory. Black and Edwards follow the logical progression of organizational forms from the division-form developed in the 1940s and 1950s to the matrix-form developed in the 1960s and 1970s. Both had a specific purpose designed to efficiently manage resources and measure performance.

Black and Edwards (2000) identify three emerging varieties emerging from the network form of organizations: the stable network, internal networked firm, and the temporary network firm. The stable network form was designed for predictable markets and aligned with a given product or service. The internal networked firm holds commonly held parts that serve firms outside the organizing firm. The temporary network firm stresses organization along the value chain and forms temporary alliances from a large pool of potential partners. Their study concluded that these new virtual or network forms allow firms to cope with a rapidly changing economic environment until a new "attractor" event occurs, allowing a new more stable system to emerge, until the next "attractor" event.

In the context of this study, Black and Edwards research leads to the conclusion that new virtual forms are not a fad but are a new way of life for contemporary organizations. Workers in this new reality will need to adapt if they want to thrive in these new virtual organizations.

Worker Motivation

What is it that will motivate workers in this new reality? Traditionally bonuses, perks and incentives and other similar tactics have been employed to motivate workers. In a recent Human Resources Management International Digest article they concluded that the key to keeping the best employees is to make them feel valued by giving them a voice in the decision making process. Incentives, including the ability to work from home, also help create employees who are happy and motivated (*Feeling valued*, 2008).

In an article on formal recognition programs, the author contends that formal recognition programs do not work. He recommends creating more personal recognition systems for rewarding employees for a job well done (Ken & Bob, 1997). In the new virtual environment motivating employees takes on an entirely new dimension. Since managers can no longer see their staff working other measures will need to be installed to determine and reward success.

As this new generation of remote workers charts new territory, the invasion of their personal space becomes increasingly violated. As managers struggle with new ways of measuring productivity, workers struggle with the partitioning of work and home life. Traditionally, a worker went to the office from 9AM to 5PM and was able to focus on their family and personal life in their off hours. The new reality of virtual teams is bringing the office into the home in the guise of computers, Blackberries, fax machines, and a host of other new technologies. The boundaries between work and home are being reduced and/or eliminated altogether (Towers et al., 2006). The following quote captures the point very clearly: “I believe that while technology has

increased the ability to work from the home and outside regular business hours, it has also increased the expectation that you do so. So while it has enhanced the ability to balance work and family, it also has complicated it" (Towers et al., 2006, p. 23).

Some studies show that there is reluctance for companies to move to distributed/virtual organizational models. As is often the case when faced with change, companies choose the conservative approach and cling to traditional brick and mortar office space. Dettwiler and Brochner (2003) conducted a study of six Swedish firms, following their growth for five years. They concluded that "growth firms do not resort to a higher proportion of remote work" (p. 59) when space becomes tight. Sometimes the perception that firms are moving in mass to virtual organizational models does not match the reality.

Productivity and Virtual Organizations

As discussed earlier, the concept of working from home is not new, the potential to move work back into the home started with the oil crisis of the 1970s (Lupton & Haynes, 2000). Alvin Toffleer (as cited in Lupton & Haynes, 2000) identified three changes in waves relevant to working from home. The first wave was before the industrial revolution when most people worked from home, the second wave occurred during the industrial revolution as work became centralized; the third wave offered a futuristic view, which gave people freedom and individual autonomy in their work. The enabler was exponential growth in information and communication technology (Lupton & Haynes, 2000). Lupton and Haynes research examined the perception-reality gap. They found that workers allowed to work from home were substantially more productive compared with workers who commuted to an office to work. They

conclude that most businesses and managers underestimate the productivity improvements (Lupton & Haynes, 2000).

Ultimately, the goal of building a virtual organization is to improve productivity. The underlying assumption is that the technology exists to support virtual organizations. Halachmi and Bouckaert (1994) examined the variables associated with measuring organizational performance in conjunction with the technology required to support remote workers. They conclude that the mix of technologies an organization selects will have a direct impact on organizational design.

Work Life Balance

As important as this new technology is to organizations it is having a very real impact on work/life balance. In a study conducted by the Work-Family Round Table, it was discovered that once people are given the technology they are expected to monitor email, voice mail and other communication at all times while away from the office (*Technology's effect on work/life balance*, 1999). Ted Childs, Vice President, Work Force Diversity at IBM points out those new work boundaries are becoming a matter of ethics. Employers and employees are beginning to question the practice of promoting productivity at the price of disrupting family lives and personal time (*Technology's Effect on Work/Life Balance*, 1999). Some question whether these work arrangements are fair to the employee and their co-workers.

New alternate work arrangements may create new kinds of stresses in organizational dynamics. Workers using flexible arrangements like telecommuting and flexible scheduling may find that it is more difficult to collaborate with others. Perceptions of injustice and unfairness may emerge. One of the dangers of these new

arrangements can be heightened turnover and reduced organizational commitment (Romaine & Schmidt, 2009). Romaine and Schmidt's study found that women are more likely than men to prefer equity to other norms. Women in this study were found to prefer family-friendly scenarios as the norm when choosing a place to work (Romaine & Schmidt, 2009).

Now that technology is providing a way to work from home, new opportunities to reintegrate with the community and family are available. Technology is now providing new way to integrate work and community. Companies are now more willing to relocate to where the people are, rather than bringing the people to them (Schriefer, 2001). There is a dynamic that requires the flow of information through and around a team. Many of the tools being developed attempt to replicate this information flow in cyberspace. Still, many jobs require thinking space and working from home provides a good environment for that. Much of the literature talks about how to replicate water cooler conversations in cyberspace. There doesn't appear to be a good way to replicate hallway conversations. That type of spontaneous interaction may be lost in the new work paradigm (Schriefer, 2001).

Gender and Virtual Teams

Gender plays a role in the move to virtual teams. As women have continued to become a more significant part of the workforce, female employees and managers face strong work/family conflicts. Firms employing a relatively large percentage of female employees are motivated to adopt flexible work practices to reduce cost and accommodate demands placed on families (Perez, Carnicer, & Sanchez, 2002). Research conducted by Perez et al. (2002) indicates that women are more enthusiastic

about working from home than are their male counterparts. Male HR managers are more worried about a loss of connectedness with coworkers than are female HR managers. Perez et al.'s research seems to imply that female workers and managers are more inclined to adopt work from home agreements than are men. Men appear to be more comfortable with the traditional work arrangement and the partitioning of work and home.

As organizations struggle with flexible work schedules and work to find solutions for men and women with families, they may fail to comprehend the affect on single employees without children. In a study conducted by Hamilton, Gordon, and Whelan-Berry (2006), they found that never-married women often do not use flexible work benefits offered by companies, which can lead to conflict in organizations. Single mothers who find the benefit of working from home to be essential can be at odds with single women who do not value or have a need for this benefit (Hamilton et al., 2006). Their findings suggest that "one size fits all" solutions do not work.

Evolution of the Office

The implementation of flexible work schedules is having a profound impact on the very nature of the office. If one could travel back in time to the 1920s or 1930s, they would find the office to be a very different place. Employees worked in the office at a desk with paper files, typewriters and telephones. Meetings were all held face to face and many managers had offices to facilitate the many meetings they had with their coworkers. Office layouts have changed dramatically with the advent of new technology. Most office workers go about their business in a cubical and the

personal computer has become an important communication hub. This has affected traditional office layouts and cost (Leishman & Watkins, 2004). It has also changed the need of businesses to be located in close proximity. Office locations are routinely located great distances from their customers and/or suppliers.

The modern worker can now choose to work in the office or somewhere else. This is a significant paradigm shift from the 1970s or 1980s. It also raises questions about the form of the office. If a desk will be empty 90% of the time, it may be prudent to have a smaller office and share desks. Critics would argue that allowing people to work outside of the office may destroy links between workers and the company (Stocks, 1998).

Undeniably, the trend toward the virtual office is a growing trend. New office designs are evidence of the trend. It is the focus of this study to examine job satisfaction in this changing environment. Some consider a big corner office a measure of success. There may be some questions around whether the new office environment robs some employees of their prestige. Perks from the 1950s like private parking places and large offices with administrative services may be a thing of the past. As it is becomes clear that the office is changing will workers be happier? What affect does the new office have on job satisfaction? A review of the history and current trends in job satisfaction research may shed some light on this.

Career Growth and Compensation

One may assume that there is an assumed relationship between job satisfaction and pay. Taylor's (1911) work in the late 1800s and early 1900s indicated that money was a major factor in motivating people to increase their productivity.

Empirical evidence has shown that money is not a universal motivator for workers (Savery, 1996). Researchers in the 1950s and 1960s argued that over factors like recognition, the work itself, growth, responsibility and advancement were important motivators. Herzberg (as cited in Tietjen & Myers, 1998) suggested that other factors also satisfied workers. Items such as company policy, supervision, interpersonal relationship, working conditions status and security were hygiene factors, that if not present at satisfactory levels contributed to low job satisfaction (Savery, 1996). Contemporary workers may rate pay higher than workers from the 1950s, but they still value many of the same things as their predecessors. The ability to work from home has introduced a new variable in the job satisfaction equation.

Factors in Job Satisfaction

Several models for measuring job satisfaction have been developed. One such model is the Job Characteristics Model (JCM) developed by Hackman and Lawler (as cited in Goris, 2007). This model looks for a correlation between individual needs and the motivating characteristic of a job to produce a high level of performance and satisfaction. This model is unique in that it specifies a match between the individual's needs and the characteristics of a particular job. The emphasis is on the output variables of performance and satisfaction. Because some results were inconsistent, John Kelly (as cited in Goris, 2007) developed a newer model called the twin track model of job re-design. Goris (2007) conducted a very detailed quantitative study using the JCM model and found a strong correlation between communication and job satisfaction/performance. He also noted that high markers on communication were a good indicator of future performance and job satisfaction. This proposes important

implications for virtual works. The quality of communication when working on a virtual team may be a key component in building a highly effective virtual team.

Another important factor in job satisfaction is rank. In a study conducted by Titus Oshagbemi (1997) a strong correlation was found between and employees rank in the organization and job satisfaction. The study concluded with 95% confidence that overall job satisfaction increases with rank. The study also showed that job satisfaction among female participants was higher than for their male counterparts. This brings into question the opportunities for advancement within working on a virtual team. An area for further study would be opportunities for promotion when working virtually versus on site.

In an analysis of Hertzberg and Locke's work on job satisfaction, Tietjen and Myers (1998) note that both theories point to the work itself as the primary factor in worker satisfaction. Hertzberg (1998) concluded that workers performed best when stimulation is internal and work related. Locke's theories of satisfaction take into account values and conclude that if key events and factors conform to the workers values, they will be satisfied (as cited in Tietjen & Myers, 1998). In the new world of virtual work teams, it may be acceptable to assume that hygiene factors associated with Hertzberg's model will be optimized, since the worker can choose his or her work environment. That environment may even be their home, the most comfortable possible workplace for many individuals. Ones value system might also come into play in a virtual work environment. Since there may be more flexibility in the way an individual is allowed to work when working as part of a virtual team, individuals may find themselves in situations that better complement their value system.

Any discussion of the work of Herzberg and Locke and their early research on job satisfaction can easily lead to a conversation about the history of job satisfaction research. Thomas A. Wright (2006) provided a historical overview of job satisfaction research throughout the twentieth century. Wright observes that more than 10,000 studies had been performed on job satisfaction prior to 1997. He concludes that the reason for all this research is the belief that a satisfied worker is more productive. Researchers are looking for a correlation between job satisfaction and productivity. The original work performed by Fredrick Winslow Taylor, which concluded that physical strength and dexterity were important factors in job satisfaction, did not deal with job satisfaction. He concluded that the basic tenants of scientific management held true and that workers who accepted those basic tenants received the highest possible wages with the least amount of physical and mental fatigue and would be the most satisfied and productive (as cited in Wright, 2006).

The work of Munsterberg (as cited in Wright, 2006) built on Taylor's work and focused on mental monotony and boredom. Taylor described monotony in terms of unpleasant feeling that repetitious tasks aroused in workers. The Hawthorne study began to investigate the effects of such factors as rest pauses and incentives on workers fatigue and monotony. Studies then shifted to look at employees attitudes, when changes made based on earlier studies were not achieving the desired results (Wright, 2006).

In the 1920s, Thurstone completed work on measuring attitude. Thurston defined attitude as, "the sum total of man's inclinations and feelings, prejudice or bias, preconceived notions, ideas, threats, and convictions about any specific topic" (as

cited in Wright, 2006, p. 62). Throughout the 1920s through the 1960s a great deal of research was compiled in an attempt to measure attitudes. As labor unions became important in the workplace in the 1950s and sixties concerns for workers' satisfaction became more important to corporate management. Unions negotiated wages and overtime pay in an effort to improve work conditions. Studies conducted by Hawthorne, Kornhauser, and Houser on new ways of developing questionnaires help drive progress in the understanding of worker satisfaction and productivity (as cited in Wright, 2006). These early pioneers in job satisfaction research laid the foundation for the work being done in this study. Wright (2006) concludes that early research examined employee monotony, boredom and fatigue and their relationship with job performance. He believes that job satisfaction and job performance are related, yet, in spite of thousands of studies, concludes that a definitive link between job satisfaction and job performance has yet to be made. He thinks that new research can benefit from the learning of early researchers and should be considered. The worker of the future will encounter new challenges as work teams become increasingly distributed. Workers may begin to feel isolated.

Isolation and Job Satisfaction

In research performed by Gina Vega and Louis Brennan in 2000, the relationship between isolation and technology was examined; they observed that throughout history, "isolation has been used successfully as a powerful tool for delivering punishment" (Vega & Brennan, 2000, p. 649). An unintended consequence of new distributed work teams may be to leave workers feeling isolated. If a worker is isolated from the rest from the team when working in a virtual environment, what

impact does that have on their job satisfaction? Isolation has many definitions. It is different from privacy in that it is imposed by others and not necessarily related to physical separation. It is closely associated with alienation, and is linked in organizations to formal status of those in low status (Vega & Brennan, 2000). Some of the anxiety that comes with isolating has to do with one's ability to control the situation. If a worker feels that he/she can control the situation, than the stress levels are low. In a study conducted by Organ (as cited in Vega & Brennan, 2000) it was demonstrated that people who work under conditions of randomly intermittent noise work more productively and with less stress if they are given the ability to press a button to stop the noise.

As technology changed and production tasks became more automated, workers asked for increased control over day-to-day operations and became more focused on the flow of information, rather than details of the production task. This change in roles leads to adaptive restructuring on the part of groups (Vega & Brennan, 2000). As individuals on teams become more isolated and rely more on communication tools like email and instant messaging some workers may become emboldened and feel free to berate or criticize others via email, saying things they would never consider in a face to face meeting.

The unintended consequence of this behavior may be alienation or isolation of certain individuals. A bullying effect or virtual form of ostracizing may occur. Vega and Brennan (2000) warn that an unintended consequence of the new world of virtual teams may be the creation of dysfunction through isolation. Members of the team may begin to feel left out or isolated from the rest of the team. They may feel "out of

the loop." They conclude that opportunities for shared experiences may need to be increased in order to avoid this phenomenon. Some form of team building and/or face-to-face meetings may be required to help identify and solidify group norms. Vega and Brennan refer to these new workers as "open collar" workers and advocate creating connections between these workers to improve the linkage between their work and behavior.

Opposing Views on Virtual Teams

Kym Thorne (2005) published a fascinating piece relating the trends in virtual organization and business theory to science fiction. He offers some intriguing insight into how science fiction literature and its utopian view of the workplace of the future are creating a sort of a blueprint for the virtual workplace of the future. The piece offers a somewhat cynical view of the future of globalization and virtual workplaces. Thorne believes that there may be a naïve belief that in the office of the future humans will become cogs in the part of a larger process driven cyber-based machine. He believes that this dehumanization of the workplace is not necessarily a given, and may not be the answer to all organizational ills. He claims that the idea that all human interaction can be replaced by computers and the Internet is an idealistic view and will not become the solution to all organizational woes, as portrayed in some science fiction literature (Thorne, 2005). Many of his conclusions rebuke the idea that the world is on an unstoppable path to globalization and virtual workplaces. There is a kind of inherent chaos and/or anarchy that will replace the orderly hierarchical design of many present-day businesses with a flattened structure where individuals have more control over their jobs and their day-to-day tasks (Thorne,

2005). This article offers a rare contrarian view to the trend toward virtual workplaces. It raises the question, if workers are mere cogs in a greater cyber-process, will the worker be reduced to that of and easily replaced entity in a process? Will the individual be lost in the cyber-machine that is the organization of the future? It raises a concern that workers in the future will not be as likely to find rewarding and fulfilling careers.

Summary of Factors in Job Satisfaction

The review of literature related to job satisfaction points to eight factors that contribute to job satisfaction. They are: trust, feeling of belonging, flexibility, role in the decision making process, work life balance, communication, rank and task matching (job is well matched with the workers skills and interests). Female workers with families tend to value flexibility above many other factors as an important factor in job satisfaction. It is difficult to find literature that ranks pay as a key factor in job satisfaction, yet many believe that improving compensation will increase job satisfaction. The literature reviewed here does not support a correlation between pay and job satisfaction.

Conclusions

A survey of the literature reviewed to this point leads one to several conclusions. In order for and effective virtual team to be created proper leadership and organizational structures must be in place to facilitate effective communication for success. Leaders of these organizations must be disciplined and proved clear direction for the team. Communication is a very important component in building highly successful virtual global teams. Employee satisfaction will largely be based

on the workers physical environment and supported with clearly defined goals and objectives. Managers who provide the appropriate direction and organizational discipline will likely have success in managing virtual organization.

Virtual Team Studies

Virtual team research is a relatively young field. Still, there has been a substantial body of research in this area. In the next section some of the qualitative and quantitative research conducted will be examined.

Relationship between job satisfaction and working remotely. Research into understanding the effects of working remote on job satisfaction has yielded a range of results. In research performed by Golden and Viega in 2005 they discovered an inverted-U shaped relationship between the percentage of time a worker telecommutes and job satisfaction. That is to say that worker who telecommute occasionally reported greater job satisfaction, this diminished as they spent more time working remote and began to increase again as they became full-time remote workers. The more control one has over their task, the more satisfied they are when working remote. If there is a great deal of interdependence on the task then job satisfaction tended to be reduced (Arrington, 2007). This data suggest that there is a strong connection between the type of job a remote worker is asked to perform and job satisfaction.

Research related to job satisfaction and family interference when working from home shows that family interference creates unhappy telecommuters. Data related to work life balance appears to point to mixed results. Some workers see an

improvement in work-life balance while others find themselves working too much (Arrington, 2007).

Engineers on virtual teams. Since the research being conducted for this study will highlight technology workers working on virtual teams, some of the research that was of particular interest was research relative to engineering teams. In 2002, Katherine Erlick conducted research on aerospace engineering teams. Her research focused on job satisfaction and motivation. She found that members of self-directed teams became more informed and were more motivated than manager directed teams. It seems that manager directed teams waited for instructions from the manager before moving ahead where self-directed teams acted on a need to know basis and were intrinsically motivated. The self-directed team gained considerable more information and tools for implementing its task initiative. The self-directed team was motivated by activities that increased their team knowledge and freely shared among team members (Erlick, 2002).

Erlick's (2002) research is germane to virtual teams in that often virtual teams act autonomously and behave as self-directed teams. Her findings that self-directed teams are more effective than manager-directed teams support the idea that a virtual team can be effective without direct management oversight. Erlick also found that the self-directed team was more cohesive than a manager-directed team. They had a shared venture or journey thought the task. The team matured together. Self-directed teams studied in Erilck's research showed high degrees of trust and accountability, which in turn showed high levels of job satisfactions by team members. There may be other

benefits to working from home or from working outside the office. Some researchers have looked at stress and the effects of working from home (Erlick, 2002).

Working at home and stress. Colleen Daly (2007) conducted a study in which she examined the stress levels of individuals working from home. Her study showed that workers working from home 4 or 5 days a week reported lower levels of stress than those that reported to the office every day. Overall levels of health between home workers and office workers appear to be the same based on her research, the data was inconclusive. She also discovered that people that work from home showed some improvement in physical well being by losing weight, increasing physical activity and improved emotional health (Daly, 2007). This research is important in that it supports the idea that job satisfaction may increase when workers are working from home. Workers have more time to take care of their health and as a result may be improving their overall state of well being. Still, there may be some relationship between cultural differences and job satisfaction. While working from home may be appropriate in some societies, it may not work as well in other cultures. Some research done about Chinese software workers highlights this point.

Leadership style and job satisfaction. Xiaofeng Chen (2008) took on a study of software teams in China to determine how leadership style affected job satisfaction. He looked at authoritarian, benevolent and moral leadership styles and their effect on Chinese software teams. He collected his data using the JDI index, which is also being used in this study. Chen discovered through his research that benevolent leadership had a strong correlation with job satisfaction. Authoritarian leaders showed a strong inverse correlation with job satisfaction. Chen's data supports the

intuitive notion that workers do not like working for tough/mean spirited leaders. Chen's work can be applied to virtual teams as well. One would expect a similar correlation to job satisfaction among virtual workers when they are managed by authoritarian leaders. It presents yet another factor to consider when looking at job satisfaction on virtual work teams.

A manager's behavior can enhance or detract from an individual team's performance. Kouzes and Posner (2002) outlined leadership behaviors that are important to job satisfaction and motivation. They are: challenge the process, inspire a shared vision, and enable others to act, model the way and encourage the heart. These skills can be measured through the use of the Leadership Practices Inventory (LPI) instrument. As in the formation of local teams, virtual teams need to have proper leadership. Using the LPI to measure manager's skills may be a good indicator that the team's leader is up to the task. It may define areas for improvement and growth.

In research conducted by Carolyn Bell Roundtree (2004) on a manager's effect on job satisfaction concluded that there is a significant correlation between Kouzes behaviors and job satisfaction for knowledge workers involved in military contracts. Her conclusion suggests that more management training would improve job satisfaction for knowledge workers in this industry. Roundtree's research is important because it supports the idea that managers can improve with training and that workers are more productive and happy when managers practice Kouzes skills. These same principles can be extended to cover virtual teams as well. Managers of virtual teams

need to be even better trained than managers of local teams, as they are dealing with workers they cannot see.

Laura Erskine (2007) looked at the relationship between leaders and distance from their employees. Erskine looks at three dimensions of distance management: structural distance, psychological distance and status distance. Structural distance being the physical distance, psychological distance characterized by a lack of interaction, and status as it relates to ones station in life and within the organization. Erskine's quantitative study presents a statistically significant argument that physical distance from leaders has a strong negative impact on job satisfaction. Her work and approach are much different from the approach taken here where a know instrument (the JDI) will be applied. She has taken liberties and identified her own dimensions, which, although creative, to not come with a great deal of supporting data, so it is difficult to evaluate the study's validity—still, the fact that her work shows a negative correlation between physical distance and job satisfaction is a data point worth noting in research to be conducted here.

Literature reviewed to this point shows some relationship between good leadership and job satisfaction. The importance of job satisfaction should not be underestimated. Although it is difficult to measure the real cost of employee turnover, or employee underperformance, intuitively, all managers know it is expensive. There are many examples of good projects losing key personnel and creating cost overruns leading the demise of a project. In the case of knowledge workers, it is even more critical to keep qualified people happy. Yun-Hui Claude Sheng (2003) performed research to uncover the relationship between job satisfaction

and employee turnover. Sheng looked at employee turnover in a forensic lab. He found that workers who left the job felt they had few opportunities for advancement, were dissatisfied with their supervisor; felt underappreciated and discriminated against for based on cultural differences. This research again highlights the role of the supervisor in job satisfaction. Although this was a local team, they were knowledge workers. Some common threads in job satisfaction emerge in much of the existing research. As virtual teams become more common, the same problems confronting local teams will need to be addressed. Communication between the supervisor and his/her subordinates must be strong and employees must feel valued. This may be even more difficult to achieve in a virtual environment.

Leadership models and virtual teams. Jim Collins (2001) identified the five levels of leadership (Table 2). In Collins model managers begin as Level 1 managers (capable) and may eventually develop into Level 5 managers (executive). Collins categorizes these managers as transformational leaders who build greatness through personal humility and professional will. The importance of a good leadership on virtual teams may be even more critical than on local teams.

In a study conducted by Seth Robert Silver (1990) he examined the relationship between transformational leadership and organizational empowerment. His quantitative study concluded that (a) leadership influences perceptions of empowerment, and (b) leadership is associated with team performance. Further, his data suggests that empowerment improves team performance and individual performance.

Table 2

Jim Collins' Five Levels of Management Hierarchy

Level	Characteristic	Description
5	Level 5 Executive	Builds enduring greatness through a paradoxical blend of personal humility and professional will
4	Effective Leader	Catalyzes commitment to and vigorous pursuit of a clear and compelling vision, stimulating higher performance standards
3	Competent Manager	Organizes people and resources toward the effective and efficient pursuit of predetermined objectives
2	Contributing Team Member	Contributes individual capabilities to the achievement of group objectives and works effectively with others in a group setting
1	Highly Capable Individual	Makes productive contribution through talent, knowledge, skills and good work habits

John A. Detamore's (2007) study on empowerment and job satisfaction takes Silver's research one-step further. Detamore employed three instruments: (a) the

management leadership questionnaire; (b) JDI; (c) job in general survey to measure job satisfaction. He found that managers at the engineering consulting firm studied had a laissez-faire style that contributed to low job satisfaction ratings for the company which was leading to high turnover. Detamore's study confirms many of the assumptions already discussed—poor management can lead to low job satisfaction and increased turnover. Relating this back to virtual organizations, one might expect similar results in a virtual team. In fact, the effect may be exacerbated as employees working in remote locations feel isolated and frustrated and begin to look for new opportunities. As discussed earlier, some workers feel the ability to work from home is a benefit that may improve retention.

Although leadership style is important to job satisfaction and performance, it may also be true that a given style of management may work best if the workers are in alignment with the manager—in other words, if there is congruence between the manager and the line worker. In 2000, Robert E. Edelson made an attempt to quantify the relationship between worker congruency with their managers and job satisfaction. Edelson used the JDI to measure job satisfaction and augmented it with a customized questionnaire to determine congruency. His study looked at supervisor's mental models and measured alignment and job satisfaction to see if there was a correlation. Edelson's research supports the idea that teams that share mental models with their supervisors have a greater degree of job satisfaction. He also determined that a consistent view across the team resulted in greater overall job satisfaction for the team. The more likeminded the team was, the more satisfied they were with each other and with their supervisor (Edelson, 2000). This is an important study because it

supports the intuitive notion about likeminded people work better together. It would be interesting to carry this study further and examine teams with a great deal of diversity. Would the diversity help or hurt the group? The assumption among contemporary managers is that diversity strengthens organizations; Edelson's data does not deal with diversity on the team.

So how do these mental models affect remote workers or telecommuters? Are there mental models that are hindering or helping virtual organizations operate successfully? Leigh Anne Clark (2007) undertook as study to show how the five personality dimensions correlate to attitudes about telecommuting. Clark based her research on the work of Kristoff-Brown, Zimmerman and Johnson from 2005. They created a "fit" theory that asserts that a person will be more successful in a job if there is congruence between the worker and their environment. Clark's two part study first identified workers attitudes toward telecommuting then examined the personalities for those with positive and/or negative attitudes toward telecommuting. Clark's study showed that people who are agreeable and conscientious make better telecommuters. She found no significant correlation between other personality factors and people with positive attitudes toward telecommuting. The results of her study imply that there are many types of people who can be successful working on virtual teams—not unlike what might be found on a co-located team. It may be that many of the same factors that determine success in a traditional office will carry over to the virtual office as well? More research on this subject would be required to determine if this is conclusive.

Job satisfaction among software engineers. The focus of this study was software engineers and their managers. The following section is a discussion of literature pertaining to software engineers and software engineering. Kurt Linberg (1999) conducted some research to better understand high turnover rates in a university software team. He hypothesized that unhappy software engineers were unproductive and likely to leave, so he went in search of a correlation. In his study 16% of the 169 software engineers surveyed were classified as dissatisfied with their jobs. A strong correlation was found between participative decision-making and job satisfaction, which he notes is common in many fields. He found no correlation between years on the job and job satisfaction (Linberg, 1999).

Older knowledge workers as telecommuters. Lord (2004) looked at retention rates for older knowledge workers. Lord contents that with the increased need for knowledge workers, these older workers need to be retained. His concern is that now that baby boomers make up a significant percentage of knowledge workers in the world and will be needed in the workforce. His assertion is that modern work environments are hostile toward older workers. Lord employed the Minnesota Satisfaction Questionnaire, the Minnesota Importance Questionnaire, and the Meyer and Allen Organizational Commitment Survey. Surveys were given to 400 knowledge workers and 246 responded. Lord's study suggests that negative stereotypes regarding older workers are unfounded. He also dispels the idea that older workers are absent more; he found no statistically significant difference statistically significant difference between older workers and their younger counterparts, although research literature reviews say otherwise. He found that older workers gain a sense of

accomplishment form the jobs that they do; they enjoy variety and creativity and derive satisfaction from harmony in the workplace. Younger workers place more importance on advancement, compensation, security and how their supervisor relates to them. Older workers place more importance on independence and their ability to do things for others. Lord's research showed no difference in commitment between older and younger workers. In general, younger workers found it harder to leave the organization for materialistic reasons, while older workers were more financially secure and felt the organization deserved their loyalty. Older workers work for pride and enjoyment; younger workers have to meet basic needs for their families (Lord, 2004).

It is interesting to think about older workers as telecommuters. One might reason that older workers want to get out of the house to see people socially, while younger workers may want to work from home so they can spend more time with their families and have increased flexibility for running errands, picking children up from school and other activities. Telecommuting may be more meaningful to younger workers, while older workers may prefer the traditional office. This would be a good area for more research. Considering differences in age and gender is important when looking at job satisfaction, but how effective are virtual teams?

In research conducted by Kevin A. Lucas in 2007 he examined the effectiveness of virtual teams versus face-to-face teams. Lucas points to the anonymous nature of virtual communications and its anti-discrimination benefit. He uses the example of email communication and how email from strangers can be from any race, religion or creed. Workers act on the information or the request, with little knowledge of the

person who made the request. He cites Thompson's five leadership skills for effectively leading a virtual team. They are:

1. Communicating effectively and using technology that fits the situation.
2. Building and atmosphere of mutual trust, respect fairness and affiliation among project team members.
3. Establish clear and inspiring shared goals, expectations, purpose and vision.
4. Leading by example with focus on visible, measurable results.
5. Coordinating and collaborating across organizational boundaries (Lucas, 2007).

These five guidelines can be applied to conventional local teams as well, but are even more important than leading a virtual team. The importance of employing good leadership practices for local teams are magnified when applied to virtual teams. Measuring team performance is outside the scope of this dissertation, but remains an important area of study for future research.

Summary

Most of the research uncovered in this literature review points to a connection between job satisfaction and job performance. Happy workers appear to be productive workers. If employers can match workers who value time at home and work-life balance with jobs that can be performed remotely both the organization and the individual will benefit. That's not to say that there are not challenges for both the organization and the individual. Organizations need competent leaders who possess strong leadership and management skills. Individuals need to be able to accept the limitations that working from home or working in a remote office brings. They may

find themselves isolated, with limited opportunities for promotion, and working more hours to compensate for communication issues. What they get in return is increased flexibility, autonomy, and more time at home with their family. Most of the research implies they are more satisfied.

Chapter 3: Methods

Research Design and Rationale

This study utilized quantitative data collected from a survey instrument, the Job Descriptive Index (JDI). This comparative study compared two groups, software engineers and software engineering managers working in two different environments, local teams and virtual teams, the salaries of both groups are roughly equivalent. The dependent variable for this study was job satisfaction as measured by the JDI survey. The independent variables were work environment (local or virtual) and work status (individual contributor or manager). The study was designed to discover whether there is a statistically significant difference between job-satisfaction and work setting (virtual vs. local). A random sample of software engineers was selected to complete an online questionnaire.

Setting

The setting for this survey was cyberspace. Workers on virtual teams use the Internet as a platform for communication. Rather than a traditional paper survey conducted face to face or via the US mail, the survey was hosted on a website, surveymonkey.com. The primary advantage to conducting the survey in cyberspace was that it expanded the potential number of candidates for participation in the survey and simplifies the process of data collection and analysis.

Sample

The sample came from the pool of software engineers selected from two groups, one at Company V and one at Company L (a former Company V division). According to the Bureau of Labor Statistic (2006), there are about 857,000 software

engineers in the USA. About 500,000 of these engineers develop applications while 350,000 develop software for computer systems (Bureau of Labor Statistics, 2009). It would be impractical to survey all 875,000 software engineers so two groups, one from Company V and one from Company L, were chosen for this study because they exemplify modern software development environments. The two groups were chosen because they are good examples of local and virtual work environments. The pool of potential software engineers at Company V and Company L represented a potential pool of about approximately 3000 software engineers of which less than 5% are managers. Given that the sample size for managers was small compared to individual contributors, the ANOVA test for variance was employed. The Company V and Company L groups being surveyed for this study employ approximately 100 engineers (including engineers and support personnel). The goal was to survey a minimum of 15 engineers in each group. Survey participants were chosen to be members of one Company V team and one Company L software development team. Not all members were asked to participate.

Human Subjects Considerations

In accordance with the Pepperdine Institutional Review Board (IRB) process, human subjects fall under category 7 as defined in Appendix B of the Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual (Pepperdine University Graduate and Professional Schools Internal Review Board [PUGPSIRB], 2008). Category 7 is defined as,

> Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language,

> communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation or quality assurance methodologies. (PUGPSIRB, 2008, p. 37)

The groups being studied were software engineers from Company V and Company L. The participants were all software engineers and/or managers of software engineers. The purpose of the investigation was to study and compare job satisfaction across groups.

The nature of human subject involvement was through the use of an online questionnaire based in part on the Job Descriptive Index (JDI). The results of the online questionnaire were used to measure differences in job satisfaction between groups and individuals involved in the study. It was expected that the protocol used in this study would qualify for an exemption by the Institutional Review Board (IRB), given the benign nature of the questions posed for the study. There was no expected psychological or physical risk to participants.

Records were kept on a personal computer and were not to be replicated. Once the data was analyzed and reported the survey data was destroyed and/or encrypted for safe keeping using software designed for that purpose. Subjects were not coded in any way that would reveal their true identity. The survey was anonymous for individuals; only the member groups were coded so comparisons could be made between the groups in question. Any data gathered that might compromise anonymity was destroyed. A copy of the complete questionnaire can be found in the appendix.

Human subjects were notified with a request to participate in the survey via email. Participants were presented with a disclaimer upon entry to the survey and presented with the terms and conditions of the survey. Informed consent was provided via a check box on the survey. The survey was anonymous.

Sampling Method

It was difficult to predict the exact number of participants who would accept the survey request, but the expectation was for about 50 software engineers and about 10 managers. In fact, 40 engineers took the survey; seven were managers. Sampling errors were considered when analyzing the data. Participants were selected from one group at each company; the Company L software driver development team and the Company V software driver development team. Permission to participate in the survey was received from the managers of the participating teams at both Company L and Company V.

Company V employs approximately 86,000 people, roughly 4000 of which are software engineers (Source: Company V). One group at Company V and one group at Company L were selected to participate in the study. The Company L group developed software drivers for Company V Flash memory, the Company V group developed software drivers for Microsoft Windows and Linux. The Company V driver team was spread across five Company V sites and is a virtual team. The Company L Flash team was located in California, and was 100% local. The goal was to survey approximately 50 engineers and 10 managers, equally divided across all groups. Twenty-two participated from Company V and 18 participated from

Company L. Participants were given three weeks to respond at which time the survey was closed and the data collected.

The sample group was a stratified sample of managers and individual contributors. The sample group was further broken down into remote managers and local team managers. Company V's graphics team was a virtual team, with large groups of engineers in Arizona, Oregon, and Texas, and two locations in California. Many of these engineers worked from remote office or from home. Company V also has software engineers in India, China and Malaysia, but they were not considered for this study. The following procedure was followed (Table *3*):

Table 3

Research Procedure

Step	Action
1	Contact survey site and participant companies management survey approval
2	Email links to survey participants
3	Users were taken to the survey hosted on surveymonkey.com
4	Surveys were open for a period of three weeks
5	Surveys were closed
6	Data was downloaded from surveymonkey.com into an Excel spreadsheet
7	Data was coded, sorted and organized
8	Data analysis began using standard statistical techniques
9	Results were interpreted

Instrumentation

The primary instrument used in the study was the Job Descriptive Index (JDI), which is "the most frequently used measure of job satisfaction" (Balzer et al., 1997, p.1105). Job satisfaction is a major concern for organizations. The three principal reasons for interest in job satisfaction are humanitarian, economic, and theoretical

(Balzer et al., 1997). Humanitarian concerns arise from the desire to have employees and managers that are satisfied with their lives and in good physical and mental health. Economic benefits can be realized from happy satisfied workers who are more productive and reduce expenses associated with health insurance, substitute employees and retraining new employees. Theoretical concerns related to job satisfaction arise from the idea that there is a direct cause and effect relationship between job satisfaction and behavior. The ability to measure and quantify job satisfaction allows for comparative analysis between organizations and can help organizations evaluate qualitative concerns, allowing organizations the ability to compare themselves with best-in-class organizations (Balzer et al., 1997).

The JDI organization has collected over 30 years of data and that data is published in the JDI user's manual for comparison. The JDI norms published in the JDI manual will be used as a basis for comparison. The JDI norm data can be found in the JDI user's manual (Balzer et al., 1997).

Analytical Techniques

The JDI measured five important aspects or facets of job satisfaction: work on present job, present pay, opportunity for promotion, supervision and coworkers. Scored for each group involved in the comparison were compared using statistical methods including analysis of variance (ANOVA). The test cases were derived from Table 4.

Table 4

Comparative Matrixes

Work Setting	Manager	Individual Contributor
Virtual Team	Virtual Manager (VM) JDI Value	Virtual Individual Contributor (VIC) JDI Value
Local Team	Local Manager (LM) JDI Value	Local Individual Contributor (LIC) JDI Value

The ANOVA test for bivariate data were used to test hypotheses for the following cases (Table *5*):

Table 5

JDI Comparison Matrix

Test Case Number	JDI Value 1	Test	JDI Value 2
Case 1	LM- JDI	Greater Than	VM-JDI
Case 2	LM-JDI	Greater Than	VIC-JDI
Case 3	LIC-JDI	Greater Than	VM-JDI
Case 4	LIC-JDI	Greater Than	VIC-JDI
Case 5	LIC-JDI	Greater Than	LM-JDI
Case 6	VIC-JDI	Greater Than	VM-JDI

Each value in the above matrix was determined by the JDI (Job Descriptive Index) values retrieved from surveys. The JDI was designed to measure characteristics of diverse organizations and groups. The JDI was designed with the following six characteristics in mind:

1. Include principal aspects of job satisfaction,
2. Easy to administer,
3. Easy to score and interpret,
4. Apply to all jobs in an organization,

5. Measure what they are supposed to measure,

6. Useful for identifying problems, choosing solutions, and evaluating changes (Balzer et al., 1997, p.14).

The JDI scale contained three states: yes, no, and cannot decide (?). Each state was applied to a list of responses beneath a given category. The scales are shown in Table *6* along with their context. Although there were only three responses for each item, the meaning may differ depending on the context of the questions. The JDI user's guide contains an appendix with statistical means and medians for the survey, so the results from the survey in this study can be compared to these reference values, providing a baseline.

Scoring for the survey was accomplished by assigning numerical values to the responses. If the question was worded so YES indicates satisfaction then Y was assigned a value of 3. If the question was worded so NO indicates satisfaction then N was assigned a value of 3. Similarly, responses indicating dissatisfied were scored with a zero (0). Responses scored with a question mark (?) were valued at 1 point. Scores were computed by summing the points obtained from an individual's response to the items in each scale (Balzer et al., 1997).

The instrument chosen for this study was the short-form JDI (see Appendix A). It has been reproduced with permission and was contained in the survey that was located on surveymonkey.com.

Since the topic of this study is job satisfaction for virtual teams, selecting an appropriate instrument for measuring job satisfaction was a primary concern. The Job Descriptive Index (JDI) was chosen based on its substantial database of historical

data. Instruments designed to measure job satisfaction are a relatively recent development. Some of the first contemporary attempts at measuring job satisfaction were published by Hoppock in 1935. He developed a four-item measure of general job satisfaction (Stanton et al., 2001). Since then, dozens of instruments have been created to measure both general job satisfaction and facets of satisfaction. The JDI and its subscales were designed to measure different facets of job satisfaction. The complete JDI questionnaire consists of 72 items and can take a great deal of time to complete (Stanton et al., 2001).

Although the full JDI is a desirable instrument and has over 40 years of data to support it—there was concern about using it for this study because it's size and complexity may dissuade participates. Rogelberg (as cited in Stanton et al., 2001) has documented that many organizations feel "oversurveyed" and that those feelings can translate into a lack of response, researchers at Bowling Green University took on the task of creating a short form JDI, the abbreviated JDI, and found that it yielded statistically similar results to the full JDI. Given this data the abbreviated JDI was chosen as the tool for research this project (Stanton et al., 2001). The results for the abbreviated JDI were found to be statistically reliable, relative to the full JDI. "For all five abridged scales, however, these values were above Nunnally and Bernstein's recommended .70 threshold" (Stanton et al., 2001, p. 1116).

The overriding goal of the Stanton study was to reduce the length of the JDI while preserving the qualities that have made the instrument useful (Stanton et al., 2001). The qualities of the JDI were clustered into three domains: (a) score validity; (b) psychometric qualities; (c) user features. There was also an effort made to

preserve the magnitudes of the correlations between JDI facet scores and external criteria (things like job satisfaction and intention to quit). The Stanton team systematically mediated tradeoffs and developed a methodology to help quantify a broad set of qualities. A second study was performed and additional samples of data collected using the shortened scales. The second sample served as a cross-validation of the validity and psychometric qualities of the abridged scales (Stanton et al., 2001).

The first study comprised of a national sample of 1,609 workers stratified by state population (55% male). Stratification was used to get good samples from underrepresented states with small populations. Sampling was random. Scoring was conducted using a five-facet scale from the 1997 revision of the JDI. The final sample size was 1,534. Ten metrics were developed for evaluating the results. Each metric was standardized by creating z scores in reference to all other items within a given facet scale. The results of the selection process appear in Table *6* (Stanton et al., 2001).

Statistics for the reduced scales were generated through a random case selection process that resulted in the value of 782 (for the variable n) for the subsample containing the full-length scales and 752 (for the variable n) for the subsample containing the abridged scales. Items were scored and summed using the standard JDI scoring system. The abridged scale scores had a possible range of 0-15. Means and standard deviations were calculated and can be found in the Stanton study. Means and standard deviations are lower than those found in the full JDI. This was expected because of the positive relationship between scale length and coefficient alpha. The values were reduced for the abridged scale.

Table 6

Results of Study 1 and Study 2

			Corrected Item-Total Correlations	
JDI Facet Scale		Item Content	Study 1	Study 2
Work	1	Gives sense of accomplishment	.70	.63
	2	Dull	.69	.71
	3	Satisfying	.65	.69
	4	Uninteresting	.69	.61
	5	Challenging	.64	.58
Pay	1	Fair	.49	.66
	2	Underpaid	.67	.68
	3	Income adequate for normal expenses	.53	.42
	4	Well Paid	.63	.48
	5	Insecure	.33	.34

(table continues)

		Corrected Item-Total Correlations		
JDI Facet Scale		Item Content	Study 1	Study 2
Promotion	1	Good chance of promotion	.72	.72
	2	Dead end job	.59	.61
	3	Promotion on ability	.63	.64
	4	Good opportunities for promotion	.68	.71
	5	Unfair promotion policy	.40	.37
Supervision	1	Praises good work	.57	.55
	2	Annoying	.58	.64
	3	Tactful	.59	.65
	4	Bad	.61	.74
	5	Up to date	.52	.55
Coworkers	1	Helpful	.62	.59
	2	Boring	.55	.46
	3	Intelligent	.65	.51
	4	Lazy	.58	.49
	5	Responsible	.65	.62

Note. Adapted from "Users' Manual for the Job Descriptive Index (JDI; 1997 Revision) and the Job in General (JIG) Scales," by William K. Balzer, Jenifer A. Kihm, Patricia C. Smith, Jennifer L. Irwin, Peter D. Bachionchi, Chet Robie, Evan F. Sinar, Luis F. Parra, 1997. Copyright 1997 by the JDI Research Group. Reprinted with permission.

Correlations comparisons were conducted using correlation matrices. The JDI subscale scores were used rather than items as indicators and focused on equivalence of inter-correlations between the scales rather than a particular factor structure. These considerations did not alter the approach or logic (Stanton et al., 2001).

The difference between each nested pair of models is represented by a chi-square difference test (Table 7). In general, a statistically significant value for a chi-square difference test would show that fit was worsened in the constrained model and therefore that the less restrictive model provided a better fit to the data. In contrast, a statistically non-significant chi-square difference test would indicate that the more restrictive model provided the best fit (Stanton et al., 2001, p.1105).

The results of the Stanton study showed that coefficient alpha reliability estimates for the abridged scales were similar to those obtained for the abridged scales. The skewness and kurtosis statistics may have caused the smaller standard deviation for coworker facet scores in comparison with other facets. "The general model fit indices were very high for all models, suggesting that observed difference between the pairs of correlation matrices were insubstantial" (Stanton et al., 2001, p.1118). Comparisons between full-length and abridge facets in Study 1 suggested no distortions of correlative relations as a result of the shortened facet scales (Stanton et al., 2001).

Table 7

Confirmatory Comparisons

Model		Chi-Square	df	ΔChi-Square (Δdf)	GFI	NNFI
Study 1	(Original sample: full length vs. abridged)					
	Baseline	0.0	1	---	1.00	1.01
	Internal correlations fixed	10.8	11	10.8 (10)	1.00	1.00
Model		Chi-Square	df	ΔChi-Square (Δdf)	GFI	NNFI
	All correlations fixed	18.3	21	7.5 (10)	1.00	1.00
Study 2	(new sample abridged vs. original sample full length)					
	Baseline	0.1	1	---	1.00	1.01
	Internal correlations fixed	42.0**	11	41.9 (10)	0.99	0.98
	All correlations fixed	76.8**	21	34.8 (10)	0.99	0.98

(table continues)

Study 3	(new sample abridged vs. original sample abridged)					
	Baseline	0.01	1	---	1.00	1.01
	Internal correlations fixed	30.8*	11	30.7 (10)	1.00	0.98
	All correlations fixed	71.9**	21	40.1 (10)	0.99	0.98

Note. GFI=goodness-of-fit index; NNFI = nonnormed fit index. Study 1 full version n=782. Study 1 abridged version n=752. Study 2 abridged version n=647.

*p<.01. **p<.001

The JDI has been described as "the most popular and widely used measure of job satisfaction. The instrument has been translated into nine different languages and administered in at least 17 countries" (Stanton et al., 2001, p. 1105). The most recent update to the instrument came in 1997 and it has been used in over 300 publications (Stanton et al., 2001). The developers of the JDI describe the short form JDI as an alternative to the full-JDI that yields statistically identical results.

> The abridged version of the JDI simultaneously preserves many desirable characteristics of the full-length version of the scale while reducing the item count, administration time, and required survey space for the instrument. The abridged instrument is suitable for modern multivariate organizational research. (Stanton et al., 2001, p.1119).

The abbreviated JDI can be found in Appendix A.

Once the data was collected inferential statistics were used to analyze the data. Data was at 90% confidence levels. Two-way ANOVA of bivariate comparisons of the overall scores obtained from the JDI instrument was employed along with homogeneity of variance test among the groups.

Short form JDI scoring system. The short form JDI consisted of five categories: (a) Work on present job (b) Present pay (c) Opportunities for promotion (d) Supervision (e) People at work. Within each category there were five phrases. Each response was assigned a point value of 3, 1 or 0. The short-form JDI scoring key for scoring is shown in Table 8.

Respondents were given the option of choosing Yes, No or "?" in response to the phrase presented in the survey. The responses were coded as shown in Table 9. A value of 1 was assigned to yes, 2 to no, and 3 to "?", Table 9 shows the coding conversion key. Favorable responses were assigned a value of 3, unfavorable responses were assigned a value of 0 and "?" received a value of 1. The JDI survey assumed that selecting "?" is closer to an unfavorable response than a favorable response, so the scale was biased in that direction. This assumption has been supported by over 30 years of data.

Table 8

Short Form JDI Scoring Key

Category	Phrase Describing Work	Yes	No	?
Work on Present Job	Satisfying	3	0	1
	Gives sense of accomplishment	3	0	1
	Challenging	3	0	1
	Dull	0	3	1
	Uninteresting	0	3	1
Present Pay	Income adequate for normal expense	3	0	1
	Fair	3	0	1
	Insecure	0	3	1
	Well paid	3	0	1
	Underpaid	0	3	1
Opportunities for Promotion	Good opportunities for promotion	3	0	1
	Promotion on ability	3	0	1
	Dead end job	0	3	1
	Good chance for promotion	3	0	1
	Unfair promotion policy	0	3	1

(table continues)

Category	Phrase Describing Work	Yes	No	?
Supervision	Praises good work	3	0	1
	Tactful	3	0	1
	Up to date	3	0	1
	Annoying	0	3	1
	Bad	0	3	1
People at Work	Boring	0	3	1
	Helpful	3	0	1
	Responsible	3	0	1
	Intelligent	3	0	1
	Lazy	0	3	1
	Total out of possible 75 points			

Table 9

Work on Present Job Example Survey Question

Work on Present Job			
Think of the work you do at present. How well does each of the following words or phrases describe your work?			
	Yes	No	"?"
Satisfying	1	2	3
Gives Sense of Accomplishment	1	2	3
Challenging	1	2	3
Dull	1	2	3
Uninteresting	1	2	3
1 for "Yes" if it describes your work 2 for "No" if it does not describe your work 3 for "?" if you cannot decide			

Note. Adapted from "Users' Manual for the Job Descriptive Index (JDI; 1997 Revision) and the Job in General (JIG) Scales," by William K. Balzer, Jenifer A. Kihm, Patricia C. Smith, Jennifer L. Irwin, Peter D. Bachionchi, Chet Robie, Evan F. Sinar, Luis F. Parra, 1997. Copyright 1997 by the JDI Research Group. Reprinted with permission.

Table 10

Work on Present Job Scoring Example with Scores

Work on Present Job				
Think of the work you do at present. How well does each of the following words or phrases describe your work?				
	Yes	No	"?"	Corresponding Scoring Responses Underlined
Satisfying	1	2	3	Score as 3
Gives Sense of Accomplishment	1	2	3	Score as 0
Challenging	1	2	3	Score as 3
Dull	1	2	3	Score as 3
Uninteresting	1	2	3	Score as 1

1 for "Yes" if it describes your work

2 for "No" if it does not describe your work

3 for "?" if you cannot decide

Note. Adapted from "Users' Manual for the Job Descriptive Index (JDI; 1997 Revision) and the Job in General (JIG) Scales," by William K. Balzer, Jenifer A. Kihm, Patricia C. Smith, Jennifer L. Irwin, Peter D. Bachionchi, Chet Robie, Evan F. Sinar, Luis F. Parra, 1997. Copyright 1997 by the JDI Research Group. Reprinted with permission.

An example showing how the scoring key was derived is shown in Table 10. In some cases, selecting no was worth 3 points and in others it was scored with 0 points. Point assignments were based on favorable responses, selecting no for dull implied a favorable response and was assigned a value of 3.

The JDI score was calculated by summing the numbers. The maximum score was 75 points and the minimum was zero. Each sub section was also tallied for a maximum score of 15. These scores were then compared to others using ANOVA bivariate comparisons to determine statistical significance. In addition, comparative analysis was performed using the historical data published in the JDI user's manual.

In order to answer the research question of job satisfaction of virtual versus local teams, the overall score for JDI was compared as well as the sub-categories for each. The comparisons were carried out in accordance with the matrix shown in

(JDI comparison matrix). This provided a complete comparison of the data gathered for the six cases listed in the matrix. The ANOVA test for significance was the basis used to support final conclusions.

Surveys were distributed on March 28, 2010 via email. The managers of the three participating teams were sent a link to the short form JDI and demographic survey on surveymonkey.com; each manager sent the link to their team. The survey was held open for three weeks and closed on April 12, 2010.

The two teams surveyed were software development teams. The virtual team came from Company V Corporation and the local team came from Company L Corporation (a 2008 Company V spinoff company). The Company L team consisted of 18 software engineers and managers. The Company V teams comprised 22 total software engineers. The goal of the study was to survey 50 workers and 10 managers, 40 workers and 7 managers were actually surveyed. This group of 40 total software engineers and managers completed 100% of the distributed surveys.

Chapter 4: Findings

Research Question

The primary research question for this study is: To what extent, if at all, is there a difference in job satisfaction between managers and individual contributors on local versus virtual teams?

Secondary Research Question

To what extent, if at all, is there a difference in job satisfaction across the following four groups of workers: entry level, mid level, senior and pre-retirement software engineers?

Findings

Findings are presented here. Figure 2 shows the distribution of participants by experience. Twelve participants have 10 to 20 years experience while only 5 have greater than 20 years. Table *11*and Table *12* show the distribution.

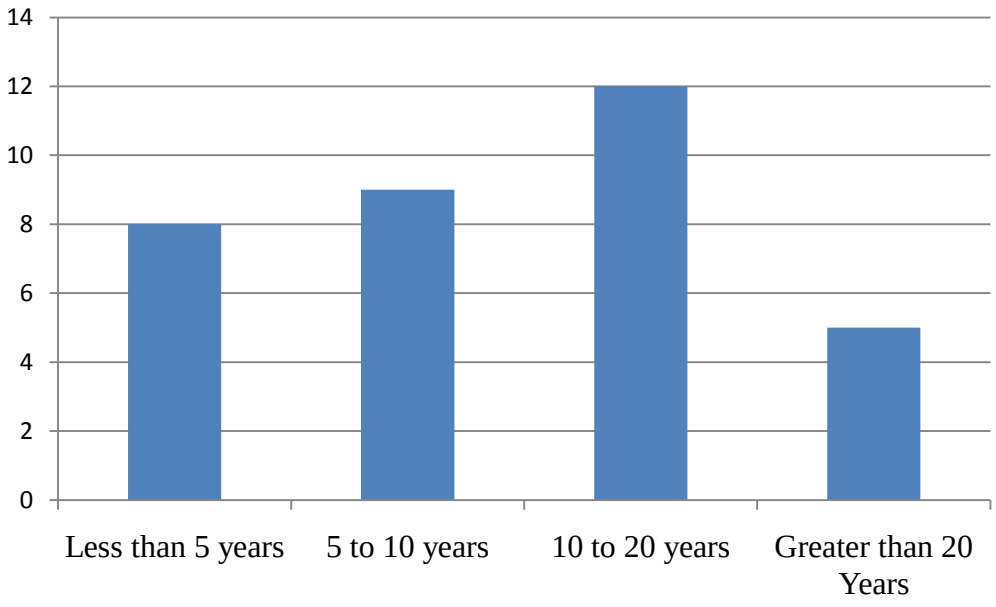

Figure 2. Participants' experience

Table 11

Supervisor and Individual Contributor Makeup of Survey Group

Years of Experience	Participants' Experience
Less than 5 Years	8
5 to 10 years	9
10 to 20 years	12
Greater than 20 years	6

Table 12

Worker Type Distribution

Worker Type	Virtual vs. Local Distribution
Virtual Supervisor	5
Local Supervisor	2
Virtual Individual Contributor	17
Local Individual Contributor	16

Figure 3 shows the distribution of virtual vs. local workers in the study. The 22 virtual workers came from the Company V team while the 18 Local workers came from the Company L Corporation.

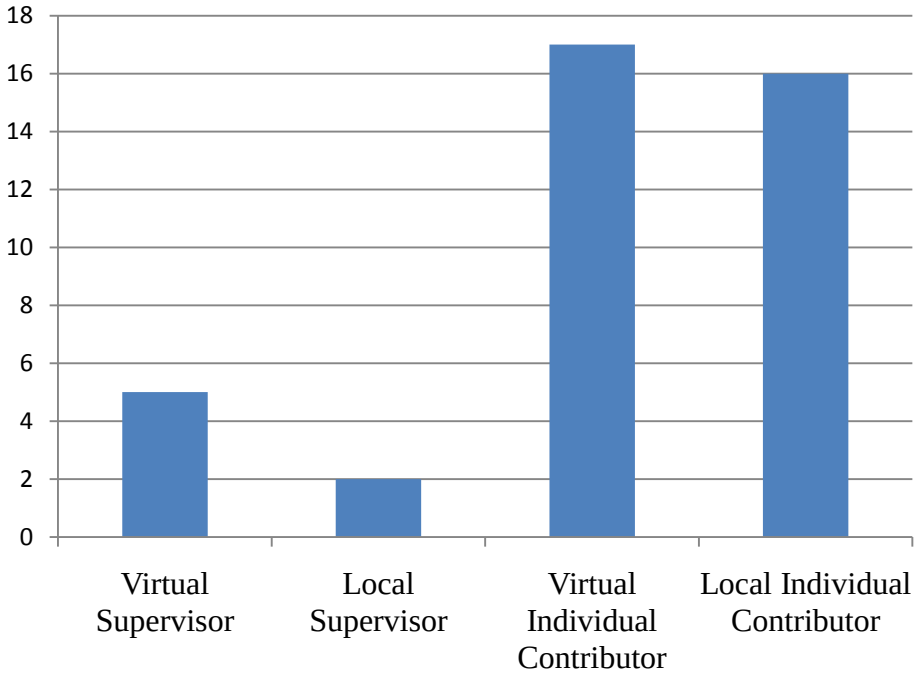

Figure 3. Virtual vs. local worker distribution: Number of workers surveyed by worker type

Of the virutal workers at Company V, four work predominately from home (18%), the remaining workers work in offices, but are not necessarily in the same city as their co-workers. The Company V software team is distributed across five sites in the United States, one site in Oregon, two sites in California, one site in Texas and one site in Arizona. Many of their co-workers work in other countries; Malaysia, India and/or China. The international workers did not participate in this survey. The survey group was limited to American workers. There was at least one worker from each of the five Company V sites. The Company L group is located in California. All Company L workers reside in the California facility.

Job Satisfaction and the JDI Data

The Job Descriptive Index (JDI) scores were tallied from the results of the survey. Once the data was tallied an ANOVA test for variance was conducted to determine if there were statistically significant differences in the results. The JDI results fall into five categories (see Chapter 3 for more detail and discussion of the JDI categories). These categories are referred to as JDI Category 1 through 5 from this point forward:

1. JDI Category 1: Work on Present Job
2. JDI Category 2: Present Pay
3. JDI Category 3: Opportunities for Promotion
4. JDI Category 4: Supervision
5. JDI Category 5: People at Work

The JDI scale ranges from 0 to 54, where 54 is 100% satisfied. The values are not absolute and will be compared to the JDI data published in the JDI user's manual (Balzer et al., 1997). The JDI manual provides tables listing JDI norms for each JDI category: Work on Present Job, Present Pay, Opportunities-for-Promotion, Supervision and People at Work. The JDI user's manual provides JDI norms based on years of experience and position (manager vs. non-manager). The tables list scores and their respective percentiles. The data will be used to compare the results of this study with JDI norms.

The data in the tables show in Appendix C contain the raw data sorted by category for all participants in the study (managers and individual contributors) listed in two columns. Column 1 lists results for the local team (Company L) and column 2

lists results for the virtual team (Company V). An ANOVA analysis was performed and is discussed in the following section.

Local vs. Virtual Team Comparisons for All Participants

The ANOVA result for the entire population (Engineers and Managers from all organizations) of the survey is presented in the following section. All tests were run using an alpha value of 0.05.

Each JDI question is designed to measure job satisfaction from five perspectives: Work on Present Job, Present Pay, Opportunities for Promotion, Supervision, and People and Work. Details on how the scores were calculated can be found in Chapter 3. The average score for all participants (managers and non-managers) was 44.3, 37.5, 33.4, 46.1 and 49.4 (out of 54) for JDI categories 1-5 respectively. The standard deviation was 15.1, 15.2, 15.8, 11.1 and 8.0 for JDI categories 1-5 respectively. Averages for Work on Present Job (44.3), Supervision (46.1) and People at Work (49.4) were the highest, with Opportunities for Promotion (33.4) and Present Pay (37.5) as the low scores. These are relative scores and were compared to JDI norms to see how this group performed relative to JDI historical data. The greatest variance in standard deviation came from the categories of Work on Present Job (15.1), Present Pay (15.2) and Opportunities for Promotion (15.8). The standard deviation was low for Supervision (11.1) and People at Work (8.0).

The first research question is looking for differences in job satisfaction between virtual-team and local-team workers. The ANOVA statistic for variance is used here to see if there is any difference between the two groups for each of the five

categories. By looking at each aspect of the JDI a multi-dimensional picture of differences and where they lie can be constructed.

The first question looks at the job performed by the individual (manager or non-manager) to see if they are satisfied with their work. In the case of software engineers the work they perform is very similar, whether they are in the office or working from home or in a satellite office. It is solitary work, much like the work done by a novelist or artist. There is not a great deal of interaction with co-workers on a typical work day, other than to ask clarifying questions or to consult with others about the best approach for a given solution to a software problem. Given the type of work performed by software engineers the results of the ANOVA analysis performed on the Work on Present Job category seem reasonable. In Table *13*the results of the ANOVA analysis are shown.

Table 13

Work on Present Job ANOVA Statistic for All Participants

SUMMARY

Groups	Count	Sum	Average	Variance
Local	18	759.6	42.2	274.1506
Virtual	16	745.2	46.575	177.066

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	162.1323529	1	162.1324	0.70911	0.405989	4.149097
Within Groups	7316.55	32	228.6422			
Total	7478.682353	33				

The ANOVA analysis of the work on present job data for all participants results in a P-value of 0.40, exceeding 0.05. No statistically significant difference exists between the virtual in local teams for the data collected. In later sections the data is broken out by manager and individual contributor, so differences can be examined between managers and individual contributors. This data supports the idea that software engineers and their managers as a group see no difference in satisfaction with their work when working on a local-team versus a virtual-team.

The next aspect of the JDI to be examined is the category of Present Pay. The Present Pay category measures job satisfaction relative to compensation. This category examines differences between virtual and local-teams and their perceptions toward compensation. As discussed in the literature review, some workers are willing to work for lower pay if they have flexibility in their workday, either working from home or close to home. The data collected here helps put into perspective the differences in compensation between virtual and local-team workers. The results of the ANOVA analysis for Present Pay can be found in Table 14.

Table 14

Present Pay ANOVA Statistics for All Participants

SUMMARY				
Groups	Count	Sum	Average	Variance
Local	17	616.5	36.26471	244.1912
Virtual	15	585	39	227.5714

(table continues)

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	59.62086397	1	59.62086	0.252166	0.61922	4.170877
Within Groups	7093.058824	30	236.4353			
Total	7152.679688	31				

The ANOVA analysis of the work on present pay data for all participants results in a P-value of 0.62, exceeding 0.05. No statistically significant difference exists in this data set. This particular group of workers is equally satisfied with their compensation weather working on a virtual or a local team. There are no statistically significant differences based on the ANOVA results.

Opportunities for Promotion (All Participants)

Another factor examined in the literature review was the concern by virtual-workers relative to opportunities for promotion. Since virtual workers often work outside the office, their work may not be noticed by their manager and they may have less opportunity for promotion. The analysis of the data performed here was designed to highlight any perceived differences by the two groups relative to opportunities for promotion. Referring back to the research question, do virtual workers feel less satisfied because they do not have equal opportunities for promotion? An ANOVA analysis for variance was performed on the data and the following result received (Table *15*).

Table 15

Opportunities for Promotion ANOVA Statistics for All Participants

SUMMARY

Groups	Count	Sum	Average	Variance
Local	16	567	35.4375	161.6625
Virtual	12	369	30.75	378.6136

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	150.6696429	1	150.6696	0.594476	0.447644	4.225201
Within Groups	6589.6875	26	253.4495			
Total	6740.357143	27				

The ANOVA analysis of the work on Opportunities for Promotion data for all participants results in a P-value of 0.45, exceeding 0.05. No statistically significant difference exists in this data set. This implies that virtual workers, at least for this group, feel there is equal opportunity for promotion with their local-team counterparts.

Supervision (All Participants)

The following question was designed to gain a better understanding of how workers feel about the way they are supervised. It is not a measure of the supervisor's capabilities, but speaks more generally to the feelings the individual has about the way in which he or she is supervised. It looks at factors like tactfulness, praise, knowledge and behavior of supervisors. It was hoped that the survey data would shed some light on differences between the way local and virtual-team workers were supervised. The literature talked about additional freedoms enjoyed by virtual workers who are not constantly monitored by their supervisors. Virtual workers are

often measured by what they produce, rather than by how they work. This aspect of the JDI helps shed light on the differences between the perceptions of local vs. virtual-team workers toward supervision. The results of the ANOVA data analysis for Supervision are shown in the Table 16.

Table 16

Supervision ANOVA Statistics for All Participants

SUMMARY

Groups	Count	Sum	Average	Variance
Local	18	795.6	44.2	143.0259
Virtual	16	770.4	48.15	101.736

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	132.1623529	1	132.1624	1.068659	0.308998	4.149097
Within Groups	3957.48	32	123.6713			
Total	4089.642353	33				

The ANOVA analysis of the supervision data for all participants results in a P-value of 0.30, exceeding 0.05. No statistically significant differences exist in this data set. Based on the results of this data there appears to be no evidence that there is a difference in the perceptions related to supervision between the local and virtual teams.

People At Work (All Participants)

The fifth and final question of the JDI deals with co-workers. There was some discussion in the literature about virtual workers becoming isolated from the rest of the team. The JDI questions dealing with People at Work examine aspects of co-

worker relationships. The JDI poses questions about co-workers to discover if they are boring, helpful, lazy, intelligent and/or responsible. By measuring these factors the JDI instrument measures the workers perceptions about co-workers. The data was examined to see if there were differences in perception between a local and virtual team regarding co-workers. An ANOVA analysis was performed on the data for all participants (managers and non-managers) to test for variance (Table 17).

Table 17

People at Work ANOVA Statistic for All Participants

SUMMARY

Groups	Count	Sum	Average	Variance
Local	18	925.2	51.4	33.24706
Virtual	16	756	47.25	93.096

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	145.8847059	1	145.8847	2.3798	0.132746	4.149097
Within Groups	1961.64	32	61.30125			
Total	2107.524706	33				

The ANOVA analysis of the work on People at Work for all participants results in a P-value of 0.13, exceeding 0.05. No statistically significant differences exist in this data set. This data shows that there is no variance in the two groups. This may support the idea that workers who work do not work in the same physical office do not feel differently about their co-workers than those who work in the same physical office. Some difference might have been expected based on the literature review.

This data does not support the idea that workers become isolated from their co-workers when working in remote offices or from home.

Summary (All Participants – Managers and Non-Managers)

After analyzing the data for all five categories of the JDI for all participating (both managers and non-managers) a summary was compiled and is shown in Table 18.

Table 18

Summary of ANOVA results for all participants (Includes Individual Contributors and Manager)

JDI Category	P-Value	Analysis	Conclusion
Work on Present Job	0.40	Greater Than 0.05	Accept Null Hypothesis - No Variance
Present Pay	0.62	Greater Than 0.05	Accept Null Hypothesis - No Variance
Opportunities for Promotion	0.45	Greater Than 0.05	Accept Null Hypothesis - No Variance
Supervision	0.30	Greater Than 0.05	Accept Null Hypothesis - No Variance
People at Work	0.13	Greater Than 0.05	Accept Null Hypothesis - No Variance

As a first step in addressing research question number 1, regarding job satisfaction of virtual vs. local teams, this data supports the idea that there is no measurable difference in the virtual team, represented by Company V, and the local team, represented by Company L, in the five JDI categories. In all cases the ANOVA results showed there was no variance in the data between the two groups (local team vs. virtual team) for all five JDI categories. The conclusions that can be drawn from this result will be discussed in Chapter 5.

Stratified Group Comparisons

The next section examines managers in the study. The previous section examined differences between the two groups, Company V (virtual) and Company L (local). This next section examines a sub-set of that data, the managers. Since this is a small group, only 7 managers, inferential statistics were not used. Means and standard deviations were instead used for the analysis of managerial data. The virtual-team managers are compared to the local-team managers. Average scores for the managers for each category are as follows: 54, 41.8, 34.3, 50.4, and 53 respectively (out of 54) for category 1 through 5. The standard deviation was 0, 10.6, 22.6, 5.6, and 2.7 for categories 1-6 respectively. The averages for Work on Present Job (54) Supervision (50.4) and People at Work (53) were high. Scores for Present Pay (41.8) and Opportunities for Promotions (34) were above the median, but still on the high side. The relative meaning of these scores is discussed in more detail in the section that compares this data to JDI norms. There was a great deal of variance in the Opportunities for Promotion (22.6) score, primarily with the virtual team where the standard deviation was 24.1. This data would appear to support the idea that managers of virtual teams experience differences in their view on opportunities for advancement. Managers scored very high in the category of Work on Present Job, with perfect scores in all cases. This particular group of managers appears to be very satisfied and that conclusion is supported later by the comparative JDI data. In the following section, each category is examined by looking at the mean and standard deviation for each data set.

The first category is the Work on Present Job category. As in the previous section, this is a measure of satisfaction with one's current work. All seven of the manager's surveyed registered maximum scores (mean 54 and standard deviation 0). It is assumed that these were honest responses, but these appear to be unusually high scores, indicating that the managers may have been concerned about providing a negative response (Table 19).

Table 19

Results for Work on Present Job for Mangers Only

Manager: Work on Present Job	Local	Virtual
Manager 1	54.00	54.00
Manager 2	54.00	54.00
Manager 3	no data	54.00
Manager 4	no data	54.00
Manager 5	no data	54.00
Mean	54.00	54.00
Standard Deviation	0.00	0.00

The next data set measures differences between Local Managers and Virtual Managers relative to opportunities for promotion. The purpose of this analysis was to discover differences in perceptions about opportunities for promotion for these seven managers. Here the average score for the two local managers was significantly higher (50.4) than the virtual manager score (27.9). The range of scores for the virtual managers was extreme with two managers achieving maximum scores while one manager scored extremely low at 4.5. The standard deviation of the virtual manager data was 24.11 as compared to just 5.09 between the two local managers (Table 20).

Table 20

Results for Opportunities for Promotion for Managers Only

Manager: Opportunities for Promotion	Local	Virtual
Manager 1	46.80	13.50
Manager 2	54.00	54.00
Manager 3	no data	4.50
Manager 4	no data	13.50
Manager 5	no data	54.00
Mean	50.40	27.90
Standard Deviation	5.09	24.11

The next section examines the data collected for local-team and virtual-team managers relative to present pay. The purpose of this category is to gain an understanding of the managers' perceptions about compensation. There was no evidence from the literature review that one group was better compensated than the other, so no differences were expected in this category. The mean for local managers was lower (31.5) than the virtual manager's mean (45.9). The standard deviation for the two local managers was 12.73 while the virtual manager's standard deviation was less at 7.39. This puts both local and virtual managers in the top half of the JDI range (Table 21).

Table 21

Results for Present Pay for Managers Only

Manager: Present Pay	Local	Virtual
Manager 1	22.50	40.50
Manager 2	40.50	40.50
Manager 3	no data	54.00
Manager 4	no data	40.50
Manager 5	no data	54.00
Mean	31.50	45.90
Standard Deviation	12.73	7.39

In the following section virtual-team managers and local-team managers are compared to understand their perceptions about supervision. The purpose of this category is to help gain an understanding of the virtual-team managers and local-team managers' relative perceptions about supervision. The literature review did not uncover any notable findings on differences in perceptions by managers toward their supervisors when working in remote offices versus local offices. Both local and virtual mangers scored high in this category, with a relatively small standard deviation of 7.64 and 4.32 respectively (Table 22).

Table 22

Results for Supervision for Managers Only

Manager: Supervision	Local	Virtual
Manager 1	43.20	54.00
Manager 2	54.00	43.20
Manager 3	no data	54.00
Manager 4	no data	54.00
Manager 5	no data	54.00
Mean	48.60	51.84
Standard Deviation	7.64	4.83

The following section compares local-team and virtual-team managers and their perceptions about their co-workers. As discussed earlier, there is some evidence in the literature review that virtual-team workers may feel isolated from their local-team co-workers. In the case of managers, the relationship with co-workers may be even more complex, given the managers' role in evaluating their performance. The JDI category for People at Work measures perceptions about co-workers. The average score for managers in this category was high at 50.4 for local-team managers and 54 for

virtual-team managers (Table 23). These scores will be examined later in this chapter relative to JDI norms, but they are high, even when compared to JDI norms.

Table 23

People at Work Results for Managers

Manager: People at Work	Local	Virtual
Manager 1	46.80	54.00
Manager 2	54.00	54.00
Manager 3	no data	54.00
Manager 4	no data	54.00
Manager 5	no data	54.00
Mean	50.40	54.00
Standard Deviation	5.09	0.00

Summary of Local-Team and Virtual-Team Manager Results

Table 24 contains a summary of the data for local-team and virtual-team manager results. With the exception of the Present Pay category for local managers and the Opportunities for Promotion category for virtual managers, the scores were very high. To put these scores in context, a comparison with JDI norms was performed. Those results are presented at the end of this chapter. The standard deviation is shown in Table 25.

Table 24

Manager Means Summary for Local and Virtual Teams

Summary: Manager (Means)	Local	Virtual
Work on Present Job	54.00	54.00
Opportunities for Promotion	50.40	27.90
Present Pay	31.50	45.90
Supervision	48.60	51.84
People at Work	50.40	54.00

Table 25

Manager Standard Deviation Summary for Local and Virtual Teams

Summary Manager (Standard Deviation)	Local	Virtual
Work on Present Job	0.00	0.00
Opportunities for Promotion	5.09	24.11
Present Pay	12.73	7.39
Supervision	7.64	4.83
People at Work	5.09	0.00

The results of this section are largely inconclusive, given the small size of the data set, but still paint a descriptive picture of the managers involved in this particular study. It is important to note that this appears to be a satisfied group of managers with good relationships with their respective co-workers. They are largely satisfied with their present pay and feel they have sufficient opportunities for promotion. These conclusions are further supported with the comparative JDI data at the end of this chapter.

Individual Contributor Comparisons

In the following section the data collected for virtual-team individual contributors and local-team individual contributors was analyzed. As in the previous

sections, the data from the five JDI categories listed earlier were examined. The descriptive data shows average scores of 41.7, 36.4, 33.2, 44.8, and 48.9 respectively for each JDI category 1 through 5. The standard deviation was 16.0, 16.2, 13.6, 12.0 and 8.7 respectively, relative to each JDI category 1 through 5. The Individual contributor averages were all above the median score. The lowest scores came from the Opportunities for Promotion category, where the average for the individual contributor group was 33.2 out of 54 possible points. The virtual-team and local-team average scores in that same category were very similar at 32.8 and 33.4 respectively. The standard deviation was greatest for Work on Present Job and Present Pay at 16.0 and 16.2 respectively. The standard deviations for the other three categories were 13.6, 12.0 and 8.7 for Opportunities for Promotion, Supervisor and People at Work categories respectively.

The ANOVA statistic was run on data collected for each JDI category. As in the previous sections, the two groups, local-team individual contributors and virtual-team individual contributors, data were compared. The first category considered here is the Work on Present Job category, measuring the workers perception about their present work. The Work on Present job category is designed to uncover feelings about the day-to-day work performed by each individual contributor. The ANOVA statistic was run and the result is shown in Table 26.

Table 26

Work on Present Job ANOVA Result for Local-Team Individual Contributors and Virtual-Team Individual Contributors

Summary

Groups	Count	Sum	Average	Variance
Local Individual Contributor	16	651.6	40.725	289.818
Virtual Individual Contributor	11	475.2	43.2	225.504

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	39.93	1	39.93	0.151197	0.700686	4.241699
Within Groups	6602.31	25	264.0924			
Total	6642.24	26				

The ANOVA analysis of the Work on Present Job data for all participants results in a P-value of 0.70, exceeding 0.05. No statistically significant difference exists in this data set between the two groups (local and virtual-team individual contributors). Based on this result, the data set supports the idea that local-team individual contributors and virtual-team individual contributors in this study have similar perceptions concerning their work. This data supports the idea that virtual workers can draw similar satisfaction from work performed in a local-team as those working on a virtual-team. This may be an important finding for managers considering virtual work environments. It says, at least for this group, that there is no perceived difference in the way they view their work.

In the next section, the data collected in the JDI category of Present Pay is examined. The Present Pay category is used to gain an understanding of workers' satisfaction with their compensation. Previous sections showed there were no

statistically significant differences in the data sets for the entire group (managers and non-managers) and for the managers (virtual and local) between virtual-teams and local-teams. The descriptive statistics for the Present Pay JDI category show and average score of 36.4 out of 54. This score is later analyzed using comparative JDI data to determine its significance. The ANOVA statistic was run and the result is shown in Table 27.

Table 27

Present Pay ANOVA Result for Local-Team Individual Contributors and Virtual-Team Individual Contributors

Summary

Groups	Count	Sum	Average	Variance
Local Inividual Contributor	15	553.5	36.9	263.8286
Virtual Individual Contributor	10	355.5	35.55	290.025

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	10.935	1	10.935	0.039897	0.843437	4.279344
Within Groups	6303.825	23	274.0793			
Total	6314.76	24				

The ANOVA analysis of the Present Pay data for all participants results in a P-value of 0.84, exceeding 0.05. No statistically significant difference exists in this data set. As in previous sections, the Present Pay category resulted in a comparison that showed no statistically significant difference between the two groups, local-team individual contributors and virtual-team individual contributors. This data supports the idea that compensation for each group, local and virtual, for this data set, indicates

similar attitudes toward compensation. Although no data was collected about how well these two groups were compensated, the data suggests that there is no difference relative to their satisfaction about pay.

In the following section, the JDI category of Opportunities for Promotion is examined relative to local-team and virtual-team individual contributors from the survey population. The descriptive statistics showed the average score for this category was 33.2. The Opportunity for Promotion category measures perceptions about career opportunities for the two groups, local-team individual contributors and virtual-team individual contributors. An ANOVA statistic was performed on the data collected from the survey and the result is shown in Table 28.

Table 28

Opportunities for Promotion ANOVA Result for Local-Team Individual Contributors and Virtual-Team Individual Contributors

Summary

Groups	Count	Sum	Average	Variance
Local Individual Contributor	14	468	33.42857	148.6484
Virtual Individual Contributor	7	229.5	32.78571	295.0714

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1.928571	1	1.928571	0.009896	0.921801	4.38075
Within Groups	3702.857	19	194.8872			
Total	3704.786	20				

The ANOVA analysis of the Opportunities for Promotion data for all participants results in a P-value of 0.92, exceeding 0.05. No statistically significant difference

exists in this data set. As was the case with the other categories, no statistical variance was shown between the local-team individual contributors and the virtual-team individual contributors. The lack of a difference in the data collected for these two groups may support the idea that local-team and virtual-team individual contributors have similar perceptions regarding their opportunities for advancement. One of the concerns raised in some of the data collected for the literature review implied that there might be fewer opportunities for workers who choose to work in remote location and/or from home. This data set seems to suggest that the two groups do not perceive a difference.

In the following section the data from the JDI Supervision category for local-team and virtual-team individual contributors is examined. The JDI category for supervision measures workers perceptions relative to how they are supervised, as discussed in previous sections. The average score for local-team individual contributors was 43.7 and for virtual-team individual contributors, 46.5 (out of 54). To determine if the difference in scores was significant, an ANOVA statistic for variance was run and the result is shown in Table 29.

The ANOVA analysis of the Supervision data for all participants results in a P-value of 0.56, exceeding 0.05. No statistically significant difference exists in this data set comparing local-team and virtual-team individual contributors. The result of this analysis supports the idea that perceptions about supervision are similar between these two groups (virtual and local-team individual contributors).

Table 29

Supervision ANOVA Result for Local-Team Individual Contributors and Virtual-Team Individual Contributors

Summary

Groups	Count	Sum	Average	Variance
Local Inividual Contributor	16	698.4	43.65	155.304
Virtual Individual Contributor	11	511.2	46.47273	133.3702

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	51.93818	1	51.93818	0.354453	0.556955	4.241699
Within Groups	3663.262	25	146.5305			
Total	3715.2	26				

In the following section the data collected for local-team and virtual-team individual contributors for the JDI People at Work category is examined. The average result for this was 51.5 for local-team individual contributors and 45.2 (out of 54) for virtual-team individual contributors. Both groups were well above the median for this category. The relative meaning of this data is explored later in this section. The ANOVA test for variance was used to determine if there was a statistically significant difference between the two groups, local-team individual contributors and virtual-team individual contributors. The results of the analysis can be found in Table 30.

The ANOVA analysis of the People at Work data for all participants results in a P-value of 0.059, exceeding 0.050. No statistically significant difference exists in this data set. The data set supports the idea that there is no discernable difference in perception between these two groups (local-team individual contributors and virtual-

team individual contributors) regarding their coworkers. This may be an important finding since there was some concern expressed in the literature concerning the feeling of isolation from co-workers among virtual workers. These two groups appear to be having a similar experience with regard to their co-workers, based on this data set for this group (individual contributors on virtual and local-teams at Company V and Company L).

Table 30

People at Work ANOVA Result for Local-Team Individual Contributors and Virtual-Team Individual Contributors

Summary

Groups	Count	Sum	Average	Variance
Local Individual Contributor	16	824.4	51.525	35.802
Virtual Individual Contributor	11	496.8	45.16364	114.9905

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	263.7845	1	263.7845	3.909227	0.059148	4.241699
Within Groups	1686.935	25	67.47742			
Total	1950.72	26				

In the following section, a summary of the results of the ANOVA statistic for the five JDI categories for individual contributors on virtual and local teams is presented.

Table 31

Summary of Individual Contributor ANOVA Results

Summary - JDI Category	P-Value
Work on Present Job	0.700
Present Pay	0.843
Opportunity for Promotion	0.922
Supervision	0.557
People at Work	0.059

Table 31 contains a summary of the JDI ANOVA results for the comparison between virtual and local individual contributors. In all cases, the ANOVA statistic shows no variance. The result is important because it supports the idea that workers on virtual teams are having a similar experience to their local-team counterparts. This may be important for managers making decisions about creating virtual teams, since it implies that the virtual-team individual contributors may have a similar experience to those working in local-teams.

Comparisons to JDI Norms

One of the benefits of the JDI instrument is the ability to compare results to historical norms established by the JDI Research Group. The tables in Appendix C compare the data collected with JDI norms. The tables used for this comparison can be found in the JDI user's manual (Balzer et al., 1997). Comparative data for all five categories was compiled and analyzed. In the first category, Work on Present Job, which measures satisfaction with the type of work performed on the job, the average result for local non-managers was below JDI norms in the 40th percentile, the local managers scored significantly higher than JDI norms in the 99th percentile, virtual

non-managers were in the JDI 71st percentile, and JDI virtual managers scored high in 99th percentile. This data characterizes the managers for both local and virtual teams as much more satisfied with their current work than average. The individual contributors working on virtual teams were very satisfied with their work compared with JDI norms, while the local workers from this data set are below average. This data supports the idea that the virtual workers in this data set are more satisfied with their work than are those working on local teams. This was supported in the literature, so this data agrees with some earlier studies.

The second category examined is Present Pay. This question was designed to measure satisfaction with compensation. The average result for local non-managers was above JDI norms in the 66th percentile, the local managers scores coincided with JDI norms in the 49th percentile, virtual non-managers were in the JDI 64th percentile, and JDI virtual managers scored above average in 78th percentile. In general, the individuals and managers surveyed for this survey are satisfied with their compensation, relative to JDI norms. Local managers finished in the middle and are the only group here that was not in the upper half, relative to satisfaction with compensation.

The third category is Opportunities for Promotion. This category measures perceptions for this group relative to their opportunities for career growth. The average result for local non-managers was above JDI norms in the 85th percentile, the local managers scored significantly higher than JDI norms in the 94th percentile, virtual non-managers were in the JDI 82nd percentile, and JDI virtual managers scored high in the 60th percentile. In general, the group participating in this survey

was very satisfied with its opportunities for promotion. In fact, this group scored very high relative to JDI norms. Virtual managers had the low score, but still were in the upper 60th percentile for perceptions relative to opportunities for advancement.

The fourth JDI category examined is Supervision. This category deals with perceptions relative to the quality of supervision. The average result for local non-managers was above JDI norms in the 74th percentile, the local managers also scored above JDI norms in the 73rd percentile, virtual non-managers were in the JDI 80th percentile, and JDI virtual managers scored high in 91st percentile. In all categories the scores relative to JDI norms were very high. This group is very satisfied with the way it is supervised. Even the low score among local managers was in the 73rd percentile.

The final JDI category compared with JDI norms is the People at Work category. This category measures attitudes toward co-workers. The average result for local non-managers was far above JDI norms in the 92nd percentile, the local managers scored higher than JDI norms in the 86th percentile, virtual non-managers were in the JDI 74th percentile, and JDI virtual managers scored high in 99th percentile. This group (local-team and virtual-team managers and non-managers) is extremely satisfied relative to JDI norms for attitudes about people at work. These people appear to like and appreciate their co-workers.

The data for all five categories is summarized in Table 32 and Figure 4. From these data, a very clear pattern of satisfaction emerges. The group participating in the survey is very satisfied in all five JDI categories in almost every category, both managers and non-managers.

Table 32 and Figure 4 provide a summary of the data compared with JDI norms. The average scores are plotted vs. JDI norms for each category. Only two categories fell in the lower 50th percentile: Local non-managers/Work in Present Job and local managers/ Present Pay. All other categories were in the upper 50th percentile with three categories for managers, Work on Present Job (local-manager and virtual manager) and People at Work (virtual manager), showing these managers to be in the 99th percentile for satisfaction. Based on this data, this is an above average group, relative to job satisfaction based on the five JDI categories.

Table 32

Summary of Results vs. JDI Norms

	Local		Virtual	
	Non Manager	Manager	Non Manager	Manager
Work on Present Job	40%	99%	71%	99%
Present Pay	66%	49%	64%	78%
Opportunities for Promotion	85%	94%	82%	60%
Supervision	74%	73%	80%	91%
People at Work	92%	86%	74%	99%

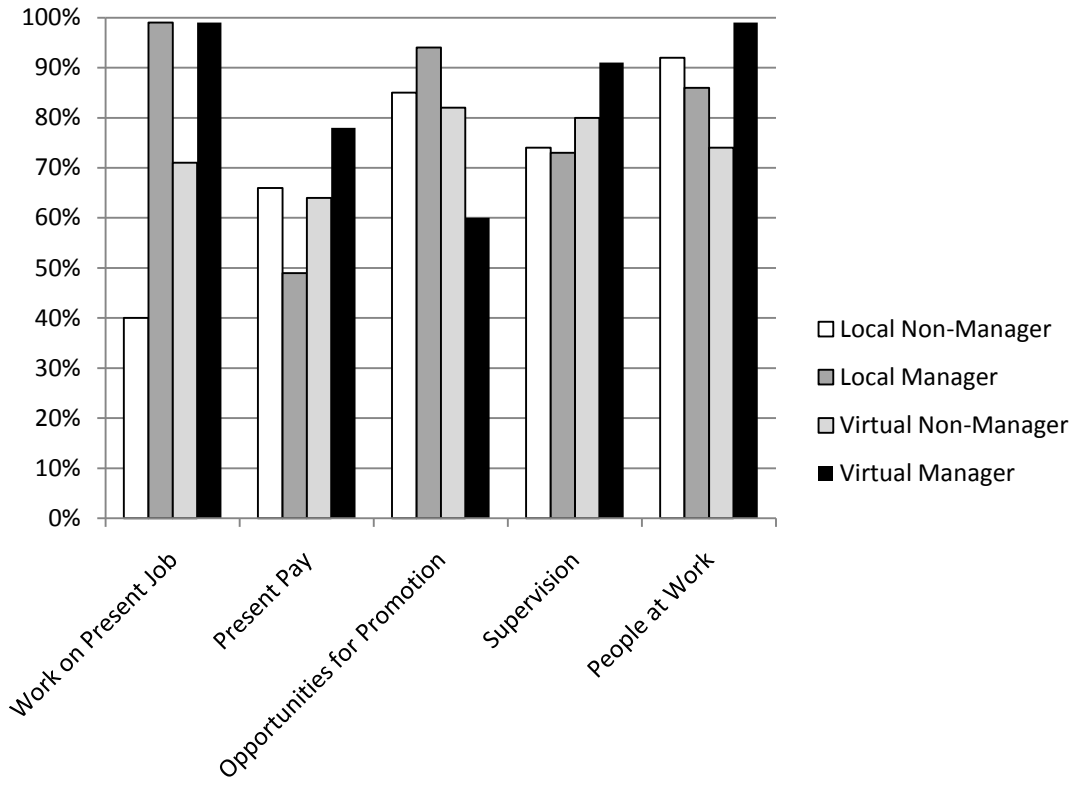

Figure 4. Summary of JDI norm data.

Research Question 2 Data Analysis

In the following section the survey data has been re-sorted and categorized by experience for evaluation based on research question 2. The purpose of the second research question is to examine job satisfaction based on experience. The raw data for this section can be found in Appendix C. Four groups were created for each experience level. The four groups' categories created for this analysis are: less than 5, 5 to 10, 10 to 20, and 20 or more years. The ANOVA statistic is used to find variance between two or more groups. In this case, there are four groups. The statistic was run for each JDI category and the results are reported in the following section. The results of this analysis will be used to help answer research question 2.

JDI Work on Present Job by Experience

The JDI category for Work on Present Job is designed to gain an understanding of workers' satisfaction with their present work. The survey data was re-sorted by experience level and can be found in Appendix C. An ANOVA statistic was run to determine variance between the four categories: less than 5, 5 to 10, 10 to 20, and 20 or more years. The results are presented in Table 33.

Table 33

ANOVA by Experience for Work on Present Job

Categories

Experience	Count	Sum	Average	Variance
Less than 5 Years	8	349.2	43.65	301.551
5 to 10 Years	9	352.8	39.2	276.84
10 to 20 Years	12	532.8	44.4	222.284
20 or More Years	5	270	54	0

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	707.982	3	235.994	1.04566	0.38669	2.92228
Within Groups	6770.7	30	225.69			
Total	7478.68	33				

In Table 33, the Work on Present Job scores for all participants has been arranged relative to experience. The ANOVA statistic was applied to see if there was significant variance in the data. All ANOVA tests run in this section use an alpha value of 0.05 ($\alpha = 0.05$). The one-way ANOVA statistic yielded a P-value of 0.39, which is greater than 0.05 and means that there is no statistically significant variation in the four experience groups.

The JDI category for Present Pay is designed to gain an understanding of workers' satisfaction with their present compensation. The survey data was re-sorted by experience level and can be found in Appendix C. An ANOVA statistic was run to determine variance between the four categories: less than 5, 5 to 10, 10 to 20, and 20 or more years. The results are presented in the Table 34.

Table 34

ANOVA by Experience for Present Pay

Categories

Experience	Count	Sum	Average	Variance
Less than 5 Years	8	319.5	39.9375	100.888
5 to 10 Years	8	256.5	32.0625	332.317
10 to 20 Years	11	355.5	32.3182	217.964
20 or More Years	5	270	54	0

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	1940.61	3	646.869	3.47507	0.0291	2.94669
Within Groups	5212.07	28	186.145			
Total	7152.68	31				

In Table 34, the Present Pay scores for all participants are arranged relative to experience. The ANOVA statistic was applied to see if there was a statistically significant variance in the data. All ANOVA tests run in this section use an alpha value of 0.05 ($\alpha = 0.05$). The one-way ANOVA statistic was run on the present pay data arranged by experience and yielded a P-value of 0.029, which is less than 0.05 and means that there is statistically significant variation in the four experience groups. A Fisher's LSD test was run as a post-hoc test to determine which group or groups

were the source of the variance. Both the 5 to 10 and 10 to 20 year groups showed a statistically significant variance when compared to the group with 20 or more years of experience. The 5 to 10 year group resulted in a p-value of .008 while the 10 to 20 year group result was .002. The statistic was run with a 0.05 alpha value. The results can be found in Appendix C.

The JDI category for Opportunities for Promotion is designed to gain an understanding of workers' satisfaction with opportunities for advancement in the organization. The survey data was re-sorted by experience level and can be found in Appendix C. An ANOVA statistic was run to determine variance between the four categories: less than 5, 5 to 10, 10 to 20, and 20 or more years. The results are presented in Table 35.

Table 35

ANOVA by Experience for Opportunities for Promotion

Categories

Experience	Count	Sum	Average	Variance
Less than 5 Years	8	288	36	214.071
5 to 10 Years	7	243	34.7143	301.821
10 to 20 Years	8	261	32.625	148.982
20 or More Years	5	144	28.8	552.825

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	176.754	3	58.9179	0.21543	0.88471	3.00879
Within Groups	6563.6	24	273.483			
Total	6740.36	27				

In Table 35, the Opportunities for Promotion scores for all participants are arranged relative to experience. The ANOVA statistic was applied to see if there was

significant variance in the data. All ANOVA tests run in this section use an alpha value of 0.05 ($\alpha = 0.05$). The one-way ANOVA statistic yielded a P-value of 0.88, which is greater than 0.05 and means that there is no statistically significant variation in the four experience groups.

The JDI category for Supervision is designed to gain an understanding of workers' satisfaction with their supervision. The survey data was re-sorted by experience level and can be found Appendix C. An ANOVA statistic was run to determine variance between the four categories: less than 5, 5 to 10, 10 to 20, and 20 or more years. The results are presented in Table 36.

Table 36

ANOVA by Experience for Work on Supervision

Experience	Count	Sum	Average	Variance
Less than 5 Years	8	381.6	47.7	84.24
5 to 10 Years	9	367.2	40.8	294.84
10 to 20 Years	12	547.2	45.6	50.2691
20 or More Years	5	270	54	0

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	588.282	3	196.094	1.68015	0.19228	2.92228
Within Groups	3501.36	30	116.712			
Total	4089.64	33				

In Table 36, the Supervision scores for all participants are arranged relative to experience. The ANOVA statistic was applied to see if there was significant variance in the data. All ANOVA tests run in this section use an alpha value of 0.05 ($\alpha = 0.05$). The one-way ANOVA statistic yielded a P-value of 0.19, which is greater than 0.05

and means that there is no statistically significant variation in the four experience groups.

The JDI category for People at Work is designed to gain an understanding of workers' satisfaction with their co-workers. The survey data was re-sorted by experience level and can be found Appendix C. An ANOVA statistic was run to determine variance between the four categories: less than 5, 5 to 10, 10 to 20, and 20 or more years. The results are presented in Table 37.

Table 37

ANOVA by Experience for Co-Workers

Categories

Experience	Count	Sum	Average	Variance
Less than 5 Years	8	410.4	51.3	58.32
5 to 10 Years	9	460.8	51.2	18.72
10 to 20 Years	12	561.6	46.8	94.2545
20 or More Years	5	248.4	49.68	93.312

ANOVA

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	139.477	3	46.4922	0.70871	0.5544	2.92228
Within Groups	1968.05	30	65.6016			
Total	2107.52	33				

In Table 37, the People at Work scores for all participants are arranged relative to experience. The ANOVA statistic was applied to see if there was significant variance in the data. All ANOVA tests run in this section use an alpha value of 0.05 ($\alpha = 0.05$). The one-way ANOVA statistic yielded a P-value of 0.55, which is greater than 0.05 and means that there is no statistically significant variation in the four experience groups.

Table 38 provides a summary of the ANOVA results for JDI scores arranged by experience. All categories but Present Pay showed no variance. It is likely that the variance in Present Pay is from the high scores for workers with over 20 years of experience. Average scores for the other categories were 40, 32, and 32. Scores for those with over 20 years experience averaged 54, which is in the 99th percentile.

Table 38

Summary of JDI ANOVA Results by Experience

Summary		
JDI Category	P-Value	Result
Work on Present Job	0.387	No Variance
Present Pay	0.029	Variance
Opportunity for Promotion	0.885	No Variance
Supervision	0.192	No Variance
People at Work	0.554	No Variance

Experience vs. JDI Norms

The following section shows the data collected based on experience. It is arranged relative to JDI norms. The raw data for this section was sorted and arranged by experience. The tables are arranged in four columns, one for each experience group: less than 5, 5-10, 10-20 and 20 or more years. An additional column was added to show the JDI norm data for the associated score. The averages for each column are displayed at the bottom (Appendix C).

The Work on Present Job data yielded the following results. This JDI category is designed to assess workers attitudes about their present work. Data collected on workers with less than five years of experience resulted in averages in the 74th percentile, those with experience of 5 to 10 years were in the 54th percentile, those

with from 10 to 20 years of experience were in the 57th percentile and those with over 20 years of experience were in the 99th percentile, relative to historical JDI norms.

The work on present pay data yielded the following results. The Present Pay category is designed to assess workers' satisfaction with current compensation. The data collected on workers with less than five years of experience resulted in averages in the 72th percentile, those with experience of 5 to 10 years were in the 54th percentile, those with from 10 to 20 years of experience were in the 51st percentile and those with over 20 years of experience were in the 99th percentile, relative to historical JDI norms.

The supervision data was sorted by experience. The data is compared to JDI norms. Data collected on workers with less than five years of experience resulted in averages in the 81st percentile, those with experience of 5 to 10 years were in the 68th percentile, those with from 10 to 20 years of experience were in the 77th percentile and those with over 20 years of experience were in the 99th percentile, relative to historical JDI norms.

The Opportunities for Promotions Data was sorted and arranged relative to experience and JDI norms. Data collected on workers with less than five years of experience resulted in averages in the 81st percentile, those with experience of 5 to 10 years were in the 81st percentile, those with from 10 to 20 years of experience were in the 72nd percentile and those with over 20 years of experience were in the 72nd percentile, relative to historical JDI norms.

The People at Work data were sorted and arranged relative to experienced. The data was compared to JDI norms. Data collected on workers with less than five years of experience resulted in averages in the 92nd percentile, those with experience of 5 to 10 years were in the 89th percentile, those with from 10 to 20 years of experience were in the 80th percentile and those with over 20 years of experience were in the 88th percentile, relative to historical JDI norms.

Summary of JDI Norms by Age Data

A summary of the data compared with JDI norms is shown in Table 39 and Figure 5. All of the data, when compared to JDI norms versus experience, show this group to be in the upper 50th percentile. In particular, the participants with more than 20 years of experience scored in the 99th percentile for Work on Present Job, Present Pay, and Supervision. Those workers scored lower than other groups on Opportunities for Promotion, but still in the 72 percentile relative to JDI norms.

Table 39

Average Results by Experience vs. JDI Norm (Percentile)

	<5	5 to 10	10 to 20	20+
Work on Present Job	74%	54%	57%	99%
Present Pay	72%	54%	51%	99%
Supervision	81%	62%	77%	99%
Opportunities for Promotion	81%	81%	85%	72%
People at Work	92%	89%	80%	88%

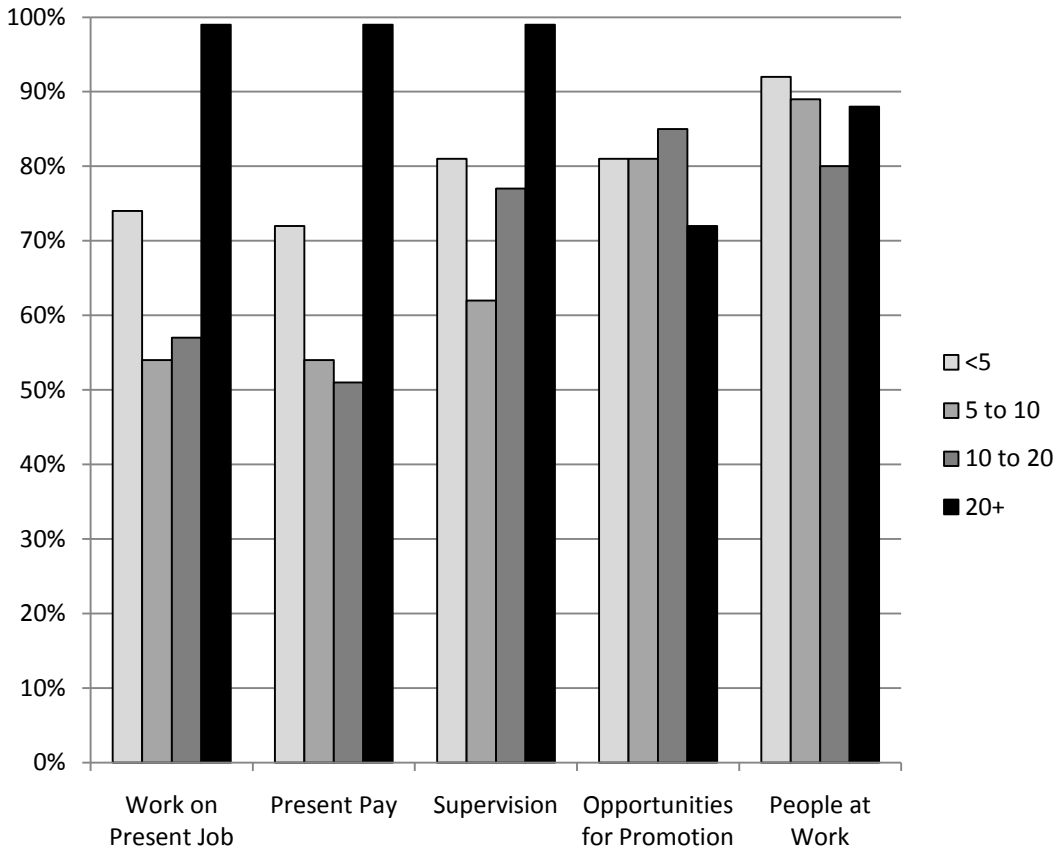

Figure 5. Summary of JDI norm data.

Chapter 5: Summary, Conclusions and Implications

Summary of Findings

Data collected for this study was designed to answer two primary research questions:

1. To what extent, if at all, are virtual workers more satisfied than their co-located counterparts?
2. To what extent, if at all, are there differences in job satisfaction based on years of experience?

There were a total of 40 respondents and all completed the survey, however, some elected to skip questions, which explains why there may not be 40 responses for all questions. Some of the data contained maximum scores, which raises some concern that the forces of social desirability were at work, especially among managers where a perfect scores of 54 was observed in a few categories. The JDI data collected for the Company V virtual team and the Company L local team showed no significant statistically significant differences. In every case comparison between virtual and local workers resulted in no statistically significant differences for the five JDI categories:

1. Work in Present Job
2. Present Pay
3. Supervision
4. Opportunities for Promotion
5. People at Work

Data collected for the Company V and Company L teams did not show a statistically significant difference based on experience, although there was some difference in the category of Present Pay, as workers with over 20 years of experience appear to be more satisfied with their pay than less experienced workers.

In general, this survey group was in the upper 50th percentile of JDI satisfaction data in all categories with two exceptions: local non-managers in the Work on Present Job category (40th percentile) and Local Managers in the Present Pay (49th percentile) category.

All participants were above the upper 50th percentile when grouped by experience vs. JDI norms. On the whole, participants from Company V and Company L were above the 50th percentile in all job satisfaction categories with their managers and experienced workers above the 90th percentile in several categories, Work on Present Job, Present Pay, and Supervision.

The data collected was compared in six different ways:

1. Local vs. Virtual teams for the entire population
2. Local vs. Virtual managers
3. Local vs. Virtual Individual Contributors
4. Comparisons to JDI Norms based on position (manager or non-manager) and type (virtual or Local)
5. Variance Comparison of JDI scores based on experience (<5, 5-10, 10-20, 20+)
6. Comparison to JDI Norms based on experience (<5, 5-10, 10-20, 20+)

Data for the entire population of Local and Virtual teams resulted in no statistically significant differences in the two groups in any category. The manager vs. manager comparisons for virtual and local teams also showed no statistically significant differences in all categories. The individual contributor comparisons resulted in no statistically significant differences in all categories. It should be noted that the data set for managers was small, with only seven managers across the entire population; this was a limitation that was expected, although this number was smaller than expected.

While tests for variance showed no statistically significant differences in all cases, comparisons to JDI norms imply that this is an above average population relative to JDI norms. In most cases, the participants scored above the 50th percentile. The seven managers from these two organizations scored above the 75th percentile versus JDI norms in all categories, with the one exception of present pay for local managers (49th percentile). Non managers performed equally well with strong showings in Opportunities for Promotion (>80th percentile), Supervision (>70th percentile), and People at Work (> 75th percentile). The only low score relative to JDI norms was with Local Non-Managers relative to Work on Present Job (40th percentile).

Relative to experience, the entire population finished above the 50th percentile in all JDI categories. Scores in all experience levels were above the 80th percentile for People at Work and above the 70th percentile for Opportunities for Promotion. The most experienced workers (20 plus years) were in the 99th percentile for Work on Present Job, Present Pay and Supervision. Work on Present Job scores dipped for

workers in mid career, 5-20 years, but were still slightly above average relative to JDI norms.

The only significant variance in data collected by experience was for Present Pay. The data seems to suggest that more experienced workers (20+ years) are more satisfied with their pay than are workers in mid career. Some of the lowest scores came from the 5 to 10 year category (3 low scores of 13.5 out of 54).

Recommendations

An important result of this research was the creation of a method for measuring relative job satisfaction using the JDI instrument. Through the use of historical data compiled for the JDI, relative job satisfaction can be determined. Therefore, it is recommended that human resource departments consider this technique for measuring job satisfaction. The literature implies that there is a link between job satisfaction and productivity. Collecting data on job satisfaction within an organization may contribute to a better overall understanding of the corporate environment. Given the difficulty in obtaining permission by outsiders to facilitate a study, it is recommended that human resources commission the study as an internal exercise under non-disclosure, with all data and records kept in confidence within the company. Consultants or outside organization used to facilitate a study should be required to sign wavers forfeiting their right of disclosure to the outside world. By keeping the results internal, there is a greater likelihood that corporate managers will support the exercise.

Conclusions

Results of this study conclude that for this group of software engineers at Company V and Company L (a former Company V division) there is no statistically significant difference in job satisfaction for managers and individual contributors working on virtual vs. local teams. Further, for this group, there is no statistically significant difference in job satisfaction based on experience.

On the whole, the Company V and Company L teams are more satisfied in all categories in job satisfaction relative to JDI norms, with one minor exception local non-managers in the category Work on Present Job. This data does not show significant differences by experience for job satisfaction based on experience for this group. Were the study conducted in a different organizational setting, where salaries are not as high, the results may have been different.

Given these results, the study supports the idea that workers on virtual teams are no more or less satisfied than those working on local teams. This may have implications for co-located organizations contemplating moving to virtual teams. It implies that there will be no change in job satisfaction for workers or managers. It may reduce concerns by organizational leaders that virtual workers will be less satisfied and less connected.

Additional Findings of Interest

The following section examines additional findings. Strengths and weaknesses of the study in addition to recommendations for future research are considered.

Strengths Weaknesses and Concessions

The weakness of this study is its limited scope. Since this study only looked at one group, software engineers at Company V and Company L, conclusions about its relevance to other types of virtual teams cannot be drawn. It does however make some very powerful statements about software workers at Company V and Company L. Given that Company L workers are ex-Company V workers, it is reasonable to assume that the cultural differences between the two organizations are not significant.

Another weakness is the small number of managers. With only seven managers, it is difficult to draw conclusions about software managers in general. Surveying a large population of managers would be a good place for future research.

The study's strength was the availability of comparative data supplied by the JDI group. The analysis versus relative JDI norms helped identify important characteristics about the population in this study. Understanding that this group is above average relative to JDI norms helps put the data in context. If, for example, the data had shown that this was a relatively unhappy group, based on JDI norms, a different set of conclusions would have emerged. The availability of JDI data helped to strengthen this research.

One concession is relative to the accuracy of the survey data. Since the surveys were collected in cyberspace, there is no way to validate the responses. There are some fundamental assumptions one must make about those who participated in the study. First and foremost, were they honest and truthful in their responses? Some of the extreme responses, especially in the case of some of the managers may raise questions of the motives of the survey takers.

Utility of Results

The results of this study create a good baseline for future research. No similar data on virtual software teams was uncovered during the literature review performed for this study, making it one of the first of its kind. The benefit of being one of the early studies on job satisfaction for virtual software teams makes for a good reference point.

Software organizations may benefit from this research when making decisions about whether or not to build new virtual teams. A factor in deciding to move toward the creation of a virtual team is job satisfaction. Given that there may be a link between job satisfaction and performance, it is beneficial to know there is data to support the belief that job satisfaction will remain unchanged once the virtual team is put in place.

Recommendations for Future Research

This research creates a good baseline for research on job satisfaction among software engineering teams. Further research on larger software teams would be beneficial. A future study on software managers would be a logical place to start new research. Looking at a large group of managers would help validate the data that was collected here.

The eight factors in job satisfaction discussed in the literature review form a good baseline for future research. The eight factors were: trust, feelings of belonging, flexibility, voice in the decision making process, work life balance, communication, rank and task matching. Each of these factors could be examined relative to virtual work environments. The literature also discussed a preference by women for flexible

work environments. Research related to gender presents another opportunity for future research.

Another area for future research would be with different types of teams. Looking at other types of engineers, marketing groups, sales organizations, and finance groups, in both technology and other industries, would all be good places to start. The methods used here could easily be applied to other industries and professions.

Another technique that might be helpful in assessing job satisfaction is the multirater or 360 degree feedback technique. This would include feedback that comes from all around the worker. The feedback would come from subordinates, peers and superordinates in the organizational hierarchy, as well as a self-assessment. This technique may help to alleviate the concern that those taking a survey may be influenced by social desirability factors.

Researcher's Observations

Performing this kind of research was a time intensive, arduous task. Collecting data on virtual teams that are distributed among many states and/or countries creates some significant obstacles. Thankfully, the Internet makes this a more manageable task. Had this research been performed without the aid of the Internet and online survey tools, it may have taken longer than the two years that were spent on this study.

Many engineers are encouraged to pursue a master's degree in business administration (MBA) to enhance their value to the organization and for their personal development. Most engineers rarely use many of the skills acquired in an MBA program, finance, accounting, and marketing, for example, perhaps the greatest

value in the MBA curriculum is the organizational development and leadership education. All engineers deal with organizational issues, and having a better grasp of organizational development and leadership techniques may help them more in their career than a course in standard accounting practices. Engineers could benefit from more organizational development training.

Researchers need to be prepared to challenge existing norms in both process and paradigms when collecting this type of data. Many managers are reluctant to have their teams surveyed and it is difficult to get organizations to have their teams participate in this kind of research. This type of research also challenges processes related to Internal Review Boards at Universities, since it may be outside current paradigms for research.

The results of this data were a bit surprising. There was an expectation that there would be significant differences between these two groups. The lack of difference may have been the most important result of this study, the fact that a team can work as effectively when separated by distance and that its members are having a similar experience to those on a local team is a significant and surprising result. Given the fast pace of technological changes it appears that the virtual workplace will become the norm in the not-too-distant future. Hopefully this research will help decision makers understand that the effect on its workers may not be as significant as previously thought.

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APPENDIX A

Short Form JDI

In the blank beside each word or phrase below, write
__1__ for "Yes"
__2__ for "No"
__3__ for "?"

Work on Present Job How well does each of the following describe your work? ____ Fascinating ____ Routine ____ Satisfying ____ Boring	**Opportunities for Promotion** How well does each of the following describe your opportunities for promotion? ____ Good opportunities for promotion ____ Opportunities somewhat limited ____ Promotion on ability ____ Dead-end job
Present Pay How well does each of the following describe your present pay? ____ Income adequate for normal expenses ____ Fair ____ Comfortable ____ Bad	**Supervision** How well does each of the following describe your supervision? ____ Supportive ____ Hard to please ____ Impolite ____ Praises good work
Coworkers How well does each of the following describe the people you work with? ____ Stimulating ____ Boring ____ Slow ____ Helpful	**Job in General** How well does each of the following describe your job most of the time? ____ Pleasant ____ Bad ____ Great ____ Worthwhile

Source: Bowling Green State University (©1975-2009)

Figure A1. Sample short form JDI form. Reprinted from the users' manual for the job descriptive index (JDI; 1997 revision). Copyright 1997 by the JDI Research Group. Reprinted with permission.

APPENDIX B

Additional Demographic Questions for Survey

1) I work on the:

_____ COMPANY V Team

_____ COMPANY L Team

2) I am a (an)

___ Supervisor (one or more direct reports)

___ Individual Contributor (no direct reports)

2) Choose the response that best represents the size of your software team

___ 0 – 10 software engineers

___10 – 20 software engineers

___20 – 30 software engineers

___30 – 40 software engineers

___40 – 50 software engineers

___50 or more software engineers

3) Choose the response that most closely represents the geographical makeup of your software team

____100% Local (all in the same facility)

____75% Local (some members work in other facilities)

____50% Local (half the team works in the same building, the rest at other locations)

____25% Local (less than 25% of the team works in the same building)

____100% Virtual (Team members are evenly distributed around the city, country or world)

4) Where do you work?

_____ Work form Home (more than 90% of the time)

_____Work in an Office (more than 90% of the time)

5) Where does your supervisor work?

____ Remote to me. (On another campus).

____ In the same building or on the same campus as me.

6) What is your experience level as a software engineer or engineering manager (total time) ?

___ Less than five years

___ Five to Ten years

___10 to 20 years

___Greater than 20 years

7) What is your age?

___ 15 to 25

___25 to 35

___35 to 45

___ 45 to 55

___ 55 to 65

___Older than 65

APPENDIX C

Survey Result Data Tables

Table C1

JDI Work on Present Job Results for All Participants (Individuals and Managers)

Raw Data		
Data Point	Local	Virtual
1	10.80	10.80
2	14.40	21.60
3	21.60	32.40
4	21.60	46.80
5	21.60	46.80
6	32.40	46.80
7	43.20	54.00
8	54.00	54.00
9	54.00	54.00
10	54.00	54.00
11	54.00	54.00
12	54.00	54.00
13	54.00	54.00
14	54.00	54.00
15	54.00	54.00
16	54.00	54.00
17	54.00	
18	54.00	

Table C2

JDI Present Pay Results for All Participants (Individuals and Managers)

Raw Data		
Data Point	Local	Virtual
1	13.50	4.50
2	13.50	13.50
3	13.50	27.00
4	18.00	31.50
5	22.50	36.00
6	27.00	40.50
7	31.50	40.50
8	40.50	40.50
9	40.50	40.50
10	40.50	40.50
11	40.50	54.00
12	45.00	54.00
13	54.00	54.00
14	54.00	54.00
15	54.00	54.00
16	54.00	
17	54.00	

Table C3

JDI Opportunities for Promotions Results for All Participants (Individuals and Managers)

Raw Data		
Data Point	Local	Virtual
1	13.50	4.50
2	18.00	13.50
3	27.00	13.50
4	27.00	13.50
5	27.00	13.50
6	27.00	27.00
7	27.00	27.00
8	31.50	40.50
9	36.00	54.00
10	40.50	54.00
11	40.50	54.00
12	45.00	54.00
13	45.00	
14	54.00	
15	54.00	
16	54.00	

Table C4

JDI Supervision Data for All Participants (Individuals and Managers)

Raw Data		
Data Point	Local	Virtual
1	10.80	14.40
2	28.80	43.20
3	32.40	43.20
4	36.00	43.20
5	36.00	46.80
6	39.60	46.80
7	43.20	46.80
8	43.20	54.00
9	46.80	54.00
10	46.80	54.00
11	54.00	54.00
12	54.00	54.00
13	54.00	54.00
14	54.00	54.00
15	54.00	54.00
16	54.00	54.00
17	54.00	
18	54.00	

Table C5

JDI People at Work Data for Managers

Raw Data		
Data Point	Local	Virtual
1	32.40	21.60
2	43.20	32.40
3	46.80	39.60
4	46.80	43.20
5	54.00	43.20
6	54.00	43.20
7	54.00	46.80
8	54.00	54.00
9	54.00	54.00
10	54.00	54.00
11	54.00	54.00
12	54.00	54.00
13	54.00	54.00
14	54.00	54.00
15	54.00	54.00
16	54.00	54.00
17	54.00	
18	54.00	

Table C6

Work on Present Job – Managers Only

Data Point	Local	Virtual
1	54	54
2	54	54
3	No Data	
4	No Data	54
5	No Data	54

Table C7

Opportunities for Promotion – Managers Only

Data Point	Local	Virtual
1	46.8	54
2	54	54
3	No Data	
4	No Data	54
5	No Data	54

Table C8

Present Pay – Managers Only

Data Point	Local	Virtual
1	22.5	40.5
2	40.5	40.5
3	No Data	54.0
4	No Data	40.5
5	No Data	54.0

Table C9

Supervision – Managers Only

Data Point	Local	Virtual
1	43.2	54.0
2	54.0	43.2
3	No Data	54.0
4	No Data	54.0

Table C10

People at Work – Managers Only

Data Point	Local	Virtual
1	46.8	54.0
2	54.0	54.0
3	No Data	54.0
4	No Data	54.0
5	No Data	54.0

Table C11

Work on Present Job – Individual Contributors Only

Data Point	Local	Virtual
1	21.6	54.0
2	14.4	32.4
3	21.6	54.0
4	54.0	21.6
5	32.4	46.8
6	54.0	46.8
7	21.6	10.8
8	43.2	54.0
9	54.0	54.0
10	54.0	54.0
11	10.8	46.8
12	54.0	No Data
13	54.0	No Data
14	54.0	No Data
15	54.0	No Data
16	54.0	No Data

Table C12

Present Pay – Individual Contributors Only

Data Point	Local	Virtual
1	13.5	40.5
2	13.5	13.5
3	54.0	27.0
4	54.0	54.0
5	27.0	31.5
6	40.5	36.0
7	31.5	54.0
8	54.0	40.5
9	13.5	54.0
10	40.5	4.5
11	54.0	No Data
12	18.0	No Data
13	40.5	No Data
14	54.0	No Data
15	45.0	No Data

Table C13

Opportunities for Promotion – Individual Contributors Only

Data Point	Local	Virtual
1	13.5	40.5
2	27.0	27.0
3	45.0	13.5
4	27.0	54.0
5	40.5	13.5
6	27.0	54.0
7	54.0	27.0
8	40.5	No Data
9	27.0	No Data
10	36.0	No Data
11	31.5	No Data
12	27.0	No Data
13	18.0	No Data
14	54.0	No Data

Table C14

Supervision – Individual Contributors Only

Data Point	Local	Virtual
1	10.8	54.0
2	36.0	54.0
3	54.0	43.2
4	54.0	43.2
5	54.0	14.4
6	54.0	54.0
7	36.0	46.8
8	39.6	54.0
9	54.0	46.8
10	46.8	54.0
11	32.4	46.8
12	46.8	No Data
13	28.8	No Data
14	43.2	No Data
15	54.0	No Data
16	54.0	No Data

Table C15

People at Work – Individual Contributors Only

Data Point	Local	Virtual
1	54.0	43.2
2	54.0	43.2
3	46.8	54.0
4	54.0	54.0
5	54.0	21.6
6	32.4	54.0
7	54.0	39.6
8	54.0	32.4
9	54.0	54.0
10	54.0	54.0
11	54.0	46.8
12	54.0	No Data
13	54.0	No Data
14	43.2	No Data
15	54.0	No Data
16	54.0	No Data

Table C16

Work on Present Job – Managers Only

Data Point	Local Non Manager	JDI NORMS Percentile	Local Manager	JDI NORMS Percentile
1	10.80	8%	54.00	99%
2	14.40	11%	54.00	99%
3	21.60	21%		
4	21.60	21%		
5	21.60	21%		
6	32.40	37%		
7	43.20	43%		
8	54.00	99%		
9	54.00	99%		
10	54.00	99%		
11	54.00	99%		
12	54.00	99%		
13	54.00	99%		
14	54.00	99%		
15	54.00	99%		
16	54.00	99%		
Mean	40.73	40%	54.00	99%

Table C17

All Survey Data Compared with JDI Norms and Categorized by worker type (Virtual vs Local Team) and Role (Manager and Non-Manager) for Work on Present Job

Data Point	Virtual Team Non Manager	JDI NORMS Percentile	Virtual Team Manager	JDI NORMS Percentile
1	10.80	8%	54.00	99%
2	21.60	21%	54.00	99%
3	32.40	37%	54.00	99%
4	46.80	74%	54.00	99%
5	46.80	74%	54.00	99%
6	46.80	74%		
7	54.00	99%		
8	54.00	99%		
9	54.00	99%		
10	54.00	99%		
11	54.00	99%		
12				
13				
14				
15				
16				
Mean	43.20	71.2%	54.00	99%

Table C18

Present Pay – Managers Only

Data Point	Local Non Manager	JDI NORMS Percentile	Local Manager	JDI NORMS Percentile
1	13.50	26%	22.50	33%
2	13.50	26%	40.50	64%
3	13.50	26%		
4	18.00	34%		
5	27.00	48%		
6	31.50	56%		
7	40.50	69%		
8	40.50	69%		
9	40.50	69%		
10	45.00	77%		
11	54.00	99%		
12	54.00	99%		
13	54.00	99%		
14	54.00	99%		
15	54.00	99%		
16				
Mean	36.90	66%	31.50	49%

Table C19

All Survey Data Compared with JDI Norms and Categorized by worker type (Virtual vs Local Team) and Role (Manager and Non-Manager) for Present Pay

Data Point	Virtual Team Non Manager	JDI NORMS Percentile	Virtual Team Manager	JDI NORMS Percentile
1	4.50	11%	40.50	64%
2	13.50	26%	40.50	64%
3	27.00	48%	40.50	64%
4	31.50	56%	54.00	99%
5	36.00	65%	54.00	99%
6	40.50	70%		
7	40.50	70%		
8	54.00	99%		
9	54.00	99%		
10	54.00	99%		
11				
12				
13				
14				
15				
16				
Mean	35.55	64%	45.90	78%

Table C20

Opportunities for Promotion – Managers Only

Data Point	Local Non Manager	JDI NORMS Percentile	Local Manager	JDI NORMS Percentile
1	13.50	61%	46.80	88%
2	18.00	73%	54.00	99%
3	27.00	82%		
4	27.00	82%		
5	27.00	82%		
6	27.00	82%		
7	27.00	82%		
8	31.50	86%		
9	36.00	89%		
10	40.50	90%		
11	40.50	90%		
12	45.00	93%		
13	54.00	99%		
14	54.00	99%		
Mean	33.43	85%	50.40	94%

Table C21

All Survey Data Compared with JDI Norms and Categorized by worker type (Virtual vs Local Team) and Role (Manager and Non-Manager) for Opportunities for Promotion

Data Point	Virtual Team Non Manager	JDI NORMS Percentile	Virtual Team Manager	JDI NORMS Percentile
1	13.50	62%	4.50	16%
2	13.50	62%	13.50	43%
3	27.00	82%	13.50	43%
4	27.00	82%	54.00	99%
5	40.50	90%	54.00	99%
6	54.00	99%		
7	54.00	99%		
8				
9				
10				
11				
12				
13				
14				
Mean	32.79	82%	27.90	60%

Table C22

Supervision - Managers Only

Data Point	Local Non Manager	JDI NORMS Percentile	Local Manager	JDI NORMS Percentile
1	10.80	9%	43.20	47%
2	28.80	40%	54.00	99%
3	32.40	46%		
4	36.00	54%		
5	36.00	54%		
6	39.60	60%		
7	43.20	69%		
8	46.80	77%		
9	46.80	77%		
10	54.00	99%		
11	54.00	99%		
12	54.00	99%		
13	54.00	99%		
14	54.00	99%		
15	54.00	99%		
16	54.00	99%		
Mean	43.65	74%	48.60	73%

Table C23

All Survey Data Compared with JDI Norms and Categorized by worker type (Virtual vs Local Team) and Role (Manager and Non-Manager) for Supervision

Data Point	Virtual Team Non Manager	JDI NORMS Percentile	Virtual Team Manager	JDI NORMS Percentile
1	14.40	15%	43.20	61%
2	43.20	69%	54.00	99%
3	43.20	69%	54.00	99%
4	46.80	77%	54.00	99%
5	46.80	77%	54.00	99%
6	46.80	77%		
7	54.00	99%		
8	54.00	99%		
9	54.00	99%		
10	54.00	99%		
11	54.00	99%		
12				
13				
14				
15				
16				
Mean	46.47	80%	51.84	91%

Table C24

All Survey Data Compared with JDI Norms and Categorized by worker type (Virtual vs Local Team) and Role (Manager and Non-Manager) for People at Work

Data Point	Local Non Manager	JDI NORMS Percentile	Local Manager	JDI NORMS Percentile
1	32.40	39%	46.80	72%
2	43.20	67%	54.00	99%
3	46.80	74%		
4	54.00	99%		
5	54.00	99%		
6	54.00	99%		
7	54.00	99%		
8	54.00	99%		
9	54.00	99%		
10	54.00	99%		
11	54.00	99%		
12	54.00	99%		
13	54.00	99%		
14	54.00	99%		
15	54.00	99%		
16	54.00	99%		
Mean	51.53	92%	50.40	86%

Table C25

Work on Present Job by Years on the Job for All Participants (Managers and Individual Contributors)

	Less Than 5	5 to 10	10 to 20	20 or More
Subject 1	10.80	14.40	10.80	54.00
Subject 2	21.60	21.60	21.60	54.00
Subject 3	46.80	21.60	32.40	54.00
Subject 4	54.00	32.40	43.20	54.00
Subject 5	54.00	46.80	46.80	54.00
Subject 6	54.00	54.00	54.00	None
Subject 7	54.00	54.00	54.00	None
Subject 8	54.00	54.00	54.00	None
Subject 9	None	54.00	54.00	None
Subject 10	None	None	54.00	None
Subject 11	None	None	54.00	None
Subject 12	None	None	54.00	None
Standard Deviation	17.4	16.6	14.9	0.0
Average	43.7	39.2	44.4	54.0

Table C26

Present Pay by Years on the Job for All Participants (Managers and Individual Contributors)

	Less Than 5	5 to 10	10 to 20	20 or More
Subject 1	27.00	13.50	4.50	54.00
Subject 2	31.50	13.50	13.50	54.00
Subject 3	31.50	13.50	18.00	54.00
Subject 4	40.50	22.50	27.00	54.00
Subject 5	40.50	40.50	36.00	54.00
Subject 6	40.50	45.00	40.50	None
Subject 7	54.00	54.00	40.50	None
Subject 8	54.00	54.00	40.50	None
Subject 9	None	None	40.50	None
Subject 10	None	None	40.50	None
Subject 11	None	None	54.00	None
Standard Deviation	10.0	18.2	14.8	0.0
Average	39.9	32.1	32.3	54.0

Table C27

Opportunities for Promotion by Years on the Job for All Participants (Managers and Individual Contributors)

	Less Than 5	5 to 10	10 to 20	20 or More
Subject 1	13.50	13.50	13.50	4.50
Subject 2	27.00	13.50	27.00	13.50
Subject 3	27.00	27.00	27.00	18.00
Subject 4	27.00	36.00	27.00	54.00
Subject 5	40.50	45.00	31.50	54.00
Subject 6	45.00	54.00	40.50	None
Subject 7	54.00	54.00	40.50	None
Subject 8	54.00	None	54.00	None
Standard Deviation	14.6	17.4	12.2	23.5
Average	36.0	34.7	32.6	28.8

Table C28

Supervision by Years on the Job for All Participants (Managers and Individual Contributors)

	Less Than 5	5 to 10	10 to 20	20 or More
Subject 1	32.40	10.80	28.80	54.00
Subject 2	36.00	14.40	39.60	54.00
Subject 3	43.20	36.00	43.20	54.00
Subject 4	54.00	43.20	43.20	54.00
Subject 5	54.00	46.80	43.20	54.00
Subject 6	54.00	54.00	46.80	None
Subject 7	54.00	54.00	46.80	None
Subject 8	54.00	54.00	46.80	None
Subject 9	None	54.00	46.80	None
Subject 10	None	None	54.00	None
Subject 11	None	None	54.00	None
Subject 12	None	None	54.00	None
Standard Deviation	9.2	17.2	7.1	0.0
Average	47.7	40.8	45.6	54.0

Table C29

People at Work by Years on the Job for All Participants (Managers and Individual Contributors)

	Less Than 5	5 to 10	10 to 20	20 or More
Subject 1	32.40	43.20	21.60	32.40
Subject 2	54.00	46.80	39.60	54.00
Subject 3	54.00	46.80	43.20	54.00
Subject 4	54.00	54.00	43.20	54.00
Subject 5	54.00	54.00	43.20	54.00
Subject 6	54.00	54.00	46.80	None
Subject 7	54.00	54.00	54.00	None
Subject 8	54.00	54.00	54.00	None
Subject 9	None	54.00	54.00	None
Subject 10	None	None	54.00	None
Subject 11	None	None	54.00	None
Subject 12	None	None	54.00	None
Standard Deviation	7.6	4.3	9.7	9.7
Average	51.3	51.2	46.8	49.7

Table C30

Work on Present Job Data Compared to JDI Norms for All Participants (Managers and Individual Contributors)

Less Than 5	JDI Percentile	5 to 10	JDI Percentile	10 to 20	JDI Percentile	20 or More	JDI Percentile
10.80	7%	14.40	8%	10.80	7%	54.00	99%
21.60	19%	21.60	15%	21.60	14%	54.00	99%
46.80	67%	21.60	15%	32.40	25%	54.00	99%
54.00	99%	32.40	30%	43.20	49%	54.00	99%
54.00	99%	46.80	63%	46.80	63%	54.00	99%
54.00	99%	54.00	99%	54.00	99%		
54.00	99%	54.00	99%	54.00	99%		
54.00	99%	54.00	99%	54.00	99%		
		54.00	99%	54.00	99%		
				54.00	99%		
				54.00	99%		
				54.00	99%		
Mean	74%	Mean	59%	Mean	71%	Mean	99%

Table C31

Present Pay Data Compared to JDI Norms for All Participants (Managers and Individual Contributors)

Less Than 5	JDI Percentile	5 to 10	JDI Percentile	10 to 20	JDI Percentile	20 or More	JDI Percentile
27.00	50%	13.50	20%	4.50	7%	54.00	99%
31.50	59%	13.50	20%	13.50	21%	54.00	99%
31.50	59%	13.50	20%	18.00	29%	54.00	99%
40.50	71%	22.50	32%	27.00	42%	54.00	99%
40.50	71%	40.50	64%	36.00	57%	54.00	99%
40.50	71%	45.00	74%	40.50	61%		
54.00	99%	54.00	99%	40.50	61%		
54.00	99%	54.00	99%	40.50	61%		
				40.50	61%		
				40.50	61%		
				54.00	99%		
Mean	72%	Mean	54%	Mean	51%	Mean	99%

Table C32

Supervision Data Compared to JDI Norms for All Participants (Managers and Individual Contributors)

Less Than 5	JDI Percentile	5 to 10	JDI Percentile	10 to 20	JDI Percentile	20 or More	JDI Percentile
32.40	40%	10.80	6%	28.80	48%	54.00	99%
36.00	50%	14.40	12%	39.60	64%	54.00	99%
43.20	64%	36.00	52%	43.20	69%	54.00	99%
54.00	99%	43.20	69%	43.20	69%	54.00	99%
54.00	99%	46.80	76%	43.20	69%	54.00	99%
54.00	99%	54.00	99%	46.80	78%		
54.00	99%	54.00	99%	46.80	78%		
54.00	99%	54.00	99%	46.80	78%		
		54.00	99%	46.80	78%		
				54.00	99%		
				54.00	99%		
				54.00	99%		
Mean	81%	Mean	68%	Mean	77%	Mean	99%

Table C33

Opportunities for Promotion Data Compared to JDI Norms for All Participants (Managers and Individual Contributors)

Less Than 5	JDI Percentile	5 to 10	JDI Percentile	10 to 20	JDI Percentile	20 or More	JDI Percentile
13.50	51%	13.50	55%	13.50	62%	4.50	26%
27.00	76%	13.50	55%	27.00	83%	13.50	62%
27.00	76%	27.00	79%	27.00	83%	18.00	75%
27.00	76%	36.00	87%	27.00	83%	54.00	99%
40.50	84%	45.00	90%	31.50	86%	54.00	99%
45.00	84%	54.00	99%	40.50	90%		
54.00	99%	54.00	99%	40.50	90%		
54.00	99%			54.00	99%		
Mean	81%	Mean	81%	Mean	85%	Mean	72%

Table C34

People at Work Data Compared to JDI Norms for All Participants (Managers and Individual Contributors)

Less Than 5	JDI Percentile	5 to 10	JDI Percentile	10 to 20	JDI Percentile	20 or More	JDI Percentile
32.40	40%	43.20	65%	21.60	25%	32.40	43%
54.00	99%	46.80	71%	39.60	57%	54.00	99%
54.00	99%	46.80	71%	43.20	68%	54.00	99%
54.00	99%	54.00	99%	43.20	68%	54.00	99%
54.00	99%	54.00	99%	43.20	68%	54.00	99%
54.00	99%	54.00	99%	46.80	74%		
54.00	99%	54.00	99%	54.00	99%		
54.00	99%	54.00	99%	54.00	99%		
		54.00	99%	54.00	99%		
				54.00	99%		
				54.00	99%		
				54.00	99%		
Mean	92%	Mean	89%	Mean	80%	Mean	88%

Table C35

Present Pay Fisher LSD Results for Each Experience Group

JDI Score LSD		Multiple Comparisons			95% Confidence Interval	
Category (I)	Category (J)	Mean Difference (I-J)	Standard Error	Sig.	Lower Bound	Upper Bound
1.00	2.00	7.875	6.654	.284	-5.828	21.578
	3.00	12.375	6.654	.075	-1.328	26.078
	4.00	-14.062	7.586	.076	-29.687	1.562
2.00	1.00	-7.875	6.654	.248	-21.578	5.828
	3.00	4.500	6.654	.505	-9.203	18.203
	4.00	-21.937*	7.586	.008	-37.562	-6.313
3.00	1.00	-12.375	6.654	.075	-26.078	1.328
	2.00	-4.500	6.654	.505	-18.203	9.203
	4.00	-26.437*	7.586	.002	-42.062	-10.813
4.00	1.00	14.062	7.586	.076	-1.562	29.687
	2.00	21.937*	7.586	.008	6.313	37.562
	3.00	26.437*	7.586	.002	10.813	42.062

*. The mean difference is significant at the 0.05 level

APPENDIX D

JDI Category Summary

Table D1

Job Descriptive Index (1997 Revision) Scales

Response	Work on Present Job	Pay	Opportunities for Promotion	Supervision	People on Your Present Job	Job in General
	Think of the work you do at present. How well does each of the following words or phrases describe your work? In the bland beside each work or phrase below, write	Think of the pay you do at present. How well does each of the following words or phrases describe your present pay? In the bland beside each work or phrase below, write	Think of opportunities for promotion that you have now. How well does each of the following words or phrases describe these? In the blank beside each word or phrase below write	Think of the kind of supervision you get on the job How well does each of the following words or phrases describe this? In the bland beside each work or phrase below, write	Think of the majority of people with whom you work or meet in connection with your work. How well does each of the following words or phrases describe these people? In the bland beside each work or phrase below, write	Think of your job in general. All in all, what is it like most of the time? In the blank beside each word or phrase below, write
Yes	Describes your work	Describes your pay	Describes opportunity for promotion	Describes the supervision you get on the job	Describes the people with whom you work.	Describes your job
No	Does not describe it	Does not describe it	Does not describe them	It does not describe it	Does not describe them	Does not describe it

Response	Work on Present Job	Pay	Opportunities for Promotion	Supervision	People on Your Present Job	Job in General
?	If you cannot decide	If you cannot decide	If you cannot decide	If you cannot decide	If you cannot decide	If you cannot decide
	* Fascinating * Routine * Satisfying * Boring * Good gives sense of accomplishment * Respected uncomfortable pleasant useful challenging * Simple * Repetitive * Creative * Dull * Uninteresting * Can see results	* Income adequate for normal expenses * Fair * Bad * Income provides luxuries * Less than I deserve * Well paid * Barely live on income * Insecure * Underpaid	* Good opportunities for promotion * Opportunities somewhat limited * Promotion on ability * Dead end job * Good chance for promotion * Unfair promotion policy * Infrequent promotion * Regular promotions * Fairly good chance of promotion	* As my advice * Hard to please * Impolite * Praises good work * Tactful * Influential * Up to date * Doesn't supervise enough * Has favorites * Tells me where I stand * Annoying * Stubborn * Knows Job Well * Bad * Poor Planner * Around when needed * Lazy	* Stimulating * Boring * Slow * Helpful * Stupid * Responsible * Fast * Company Vigilant * Easy to make enemies * Talk too much * Smart * Lazy * Unpleasant * Gossipy * Active * Narrow Interest * Loyal * Stubborn	* Pleasant * Bad * Ideal * Waste of time * Good * Undesirable * Worse than most * Acceptable * Superior * Better than most * Disagreeable * Makes me content * Inadequate * Excellent * Rotten * Enjoyable * Poor

Note. Adapted from "Users' Manual for the Job Descriptive Index (JDI; 1997 Revision) and the Job in General (JIG) Scales," by William K. Balzer, Jenifer A. Kihm, Patricia C. Smith, Jennifer L. Irwin, Peter D. Bachionchi, Chet Robie, Evan F. Sinar, Luis F. Parra, 1997. Copyright 1997 by the JDI Research Group. Reprinted with permission..